# HEATHKIT® MANUAL

HEATH COMPANY • BENTON HARBOR, MICHIGAN

## HEATH COMPANY PHONE DIRECTORY

The following telephone numbers are direct lines to the departments listed:

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## YOUR HEATHKIT 90-DAY FULL WARRANTY

If you are not satisfied with our service - warranty or otherwise - or with our products, write directly to our Director of Customer Services, Heath Company, Benton Harbor, Michigan 49022. He will make certain your problems receive immediate, personal attention.

Our attorney, who happens to be quite a kitbuilder himself, insists that we describe our warranty using all the necessary legal phrases in order to comply with the new warranty regulations. Fine. Here they are:

For a period of ninety (90) days after purchase, Heath Company will replace or repair free of charge any parts that are defective either in materials or workmanship. You can obtain parts directly from Heath Company by writing us at the address below or by telephoning us at (616) 982-3571. And we'll pay shipping charges to get those parts to you — anywhere in the world.

We warrant that during the first ninety (90) days after purchase, our products, when correctly assembled, calibrated, adjusted and used in accordance with our printed instructions, will meet published specifications.

If a defective part or error in design has caused your Heathkit product to malfunction during the warranty period through no fault of yours, we will service it free upon proof of purchase and delivery at your expense to the Heath factory, any Heathkit Electronic Center (units of Schlumberger Products Corporation), or any of our authorized overseas distributors.

You will receive free consultation on any problem you might encounter in the assembly or use of your Heathkit product. Just drop us a line or give us a call. Sorry, we cannot accept collect calls.

Our warranty does not cover and we are not responsible for damage caused by the use of corrosive solder, defective tools, incorrect assembly, misuse, fire, or by unauthorized modifications to or uses of our products for purposes other than as advertised. Our warranty does not include reimbursement for customer assembly or set-up time.

This warranty covers only Heathkit products and is not extended to allied equipment or components used in conjunction with our products. **We are not responsible for incidental or consequential damages.** Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

HEATH COMPANY
BENTON HARBOR, MI. 49022

Prices and specifications subject to change without notice.

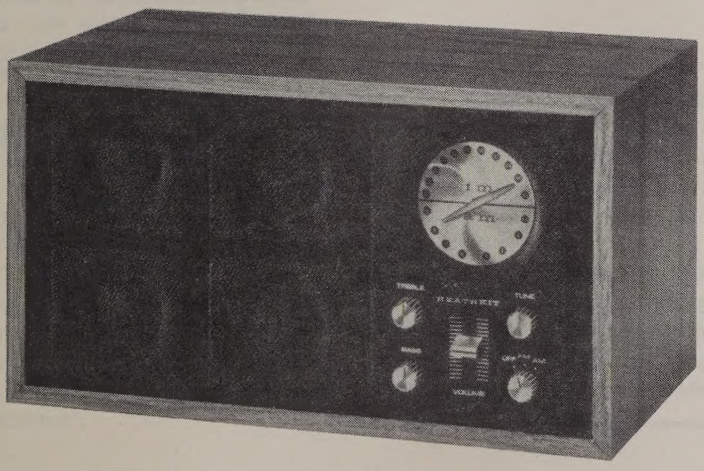
# Heathkit® Manual

*for the*

## AM-FM TABLE RADIO

Model GR-1085

595-1795-02



HEATH COMPANY
BENTON HARBOR, MICHIGAN 49022

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# INTRODUCTION

The Heathkit Model GR-1085 Table Radio has many exceptional features, including superb sound quality, outstanding sensitivity, and excellent selectivity on AM and FM bands. Its monaural output of truly high-fidelity material makes it sound like a miniature Hi-Fi system.

A preassembled and prealigned AM-FM tuner is mounted on a circuit board which also contains the IF circuits for both AM and FM. After you have assembled the kit, only a few simple adjustments are required so the circuits operate at their peak efficiency. You can easily complete these adjustments without the aid of instruments.

Solid-state amplifier circuits provide high-quality sound reproduction. Separate Treble and Bass controls provide a wide range of tones. The Radio is switched from Off to either FM or AM on a single control, and the tuning is adjusted with another small knob.

The tuned frequency is indicated by a pointer which scans a black-on-spun-aluminum dial. A ferrite-core rod antenna is used for AM reception. For FM, you may use an external antenna if one is available, or the built-in loop antenna inside the back panel of the cabinet.

Individual circuit boards for the tone circuits, the audio amplifier, and the power supply, and the two-part chassis make your Table Radio easy to assemble. Excellent reception, outstanding sound, and an attractive, wood-grained cabinet are only a few of the features that make your Table Radio a welcome addition to any room in your home.

Federal Communications Commission requirements prescribe maximum RF radiation from receivers operating above 30 MHz. This receiver will meet these requirements when constructed in strict accordance with the instructions in this Manual, using only components and materials supplied with the kit or the exact equivalent thereof. You will be instructed to sign and affix a label to the receiver certifying that you have constructed this receiver in accordance with the above mentioned instructions. In order to meet legal requirements, be certain to follow the instructions exactly as they are stated in this Manual.

# UNPACKING

AFTER YOU HAVE REMOVED THIS ASSEMBLY MANUAL AND THE "KIT BUILDERS GUIDE" FROM THE SHIPPING CARTON, DO NOT FURTHER UNPACK YOUR RADIO KIT UNTIL YOU ARE INSTRUCTED TO DO SO.

The parts for your Radio are arranged so you will have a separate parts pack for each Parts List. A cardboard box marked "Packs 1-3 TOP" contains most of the parts for packs #1, #2, and #3. These three packs will be called for, one at a time, at the beginning of the circuit board Parts Lists.

Remove the box marked "Packs 1-3 TOP" from the shipping carton, but do not open it. The parts that now remain in the shipping carton will be called the "Final Pack." This pack consists principally of larger items, and parts used in the chassis assembly section.

Open the cardboard box marked "Packs 1-3 TOP." You will see a "Pack Index Sheet" with lines on it which correspond to the packing separators and parts packs underneath. IMPORTANT: To avoid intermixing parts, DO NOT remove anything from a Parts Pack until directed to do so at the beginning of a Parts List. Any part that is packed in an individual envelope with a part number on it should be placed back in its envelope after you identify it until it is called for in a step.

*Refer to the "Kit Builders Guide" for complete information on unpacking, parts identification, and tools.*

# ASSEMBLY NOTES

1. A separate "Illustration Booklet" contains numbered illustrations (Pictorials, Details, etc.) that are too large for the Assembly Manual. The Step-By-Step Assembly instructions will direct you to the proper illustration in the Booklet. After you have completed the assembly of your kit, place the Illustration Booklet with the Assembly Manual and save them for future reference.

2. Before you start to assemble this kit, read the "Kit Builders Guide" for complete information on wiring, soldering, and step-by-step assembly procedures.

3. Always tighten hardware when it is installed unless you are instructed otherwise.

4. Each circuit part in this kit has its own component number (R2, C4, etc.). Use these numbers when you want to positively identify the same part in the various sections of the Manual. These numbers, which are especially useful if a part has to be replaced, appear:

   - In the Parts List,
   - At the beginning of each step where a component is installed,
   - In some illustrations,
   - In the Schematic,
   - In the sections at the rear of the Manual.

## CIRCUIT BOARD ASSEMBLY

1. When you install parts on the circuit boards in the following circuit board pictorials, position all parts as shown. Follow the instructions carefully and read the entire step before you perform each operation.

2. Use 1/2-watt, 10% resistors unless you are directed otherwise in a step. Resistors will be designated by the color code and the resistance value in Ω (ohms), kΩ (kilohms), or MΩ (megohms).

3. Capacitors will be designated by the capacitance value and type. Before you install a disc capacitor, remove from its leads any excess body coating material which would protrude through the circuit board and prevent soldering the leads to the foil.

4. The "component" side of a circuit board has the outlines of the parts printed on it; the "foil" side is the other side. Identify each circuit board by its part number, which will be listed in the Parts List and printed on the component side of the board. Position the boards foil-side-down as shown in the Pictorials. When a circuit board is finished, set it aside until it is called for later in the assembly instructions.

5. Due to the small foil area around some circuit board holes and the small areas between some foils, use care to prevent solder bridges from occurring between adjacent foil areas. Use a minimum amount of solder and do not heat components excessively with the soldering iron. If a solder bridge should occur, hold the circuit board above the soldering iron and heat the bridged solder between the foils. As the solder melts, the excess will flow onto the tip of the iron and remove the bridge. CAUTION: PROTECT YOUR EYES when you do this.

# TONE AND POWER SUPPLY CIRCUIT BOARDS

## PARTS LIST

Remove the parts from Pack #1 and check each part against the following list. Make a check (✓) in the space provided as you identify each part. Any part that is packed in an individual envelope with the part number on it should be placed back in the envelope after you identify it until it is called for in a step. Do not throw away any packing materials until all parts are accounted for.

Refer to the proper "Parts Pictorial" in the "Illustration Booklet" to identify parts. The key numbers in the "Parts Pictorial" correspond to the "KEY NO.'s" in the following Parts List.

| | KEY No. | PART No. | QTY. | DESCRIPTION | CIRCUIT Component No. |
|---|---|---|---|---|---|
| **RESISTORS, 1/2-WATT** | | | | | |
| NOTE: A fourth color band of silver indicates 10% tolerance; a fourth band of gold indicates 5% tolerance. | | | | | |
| ( ) | A1 | 1-3 | 3 | 100 Ω (brown-black-brown) | R601, R602, R603 |
| ( ) | A1 | 1-172 | 3 | 1000 Ω, 5% (brown-black-red) | R409, R605, R606 |
| ( ) | A1 | 1-138 | 2 | 3900 Ω, 5% (orange-white-red) | R604, R607 |
| ( ) | A1 | 1-18 | 3 | 5600 Ω (green-blue-red) | R401, R404, R406 |
| ( ) | A1 | 1-19 | 1 | 6800 Ω (blue-gray-red) | R408 |
| ( ) | A1 | 1-21 | 1 | 15 kΩ (brown-green-orange) | R403 |
| ( ) | A1 | 1-37 | 1 | 2.2 MΩ (red-red-green) | R407 |

| | KEY No. | PART No. | QTY. | DESCRIPTION | CIRCUIT Component No. |
|---|---|---|---|---|---|

## CAPACITORS

### Electrolytic

| | | | | | |
|---|---|---|---|---|---|
| ( ) | B1 | 25-54 | 2 | 10 μF tubular | C403, C405 |
| ( ) | B2 | 25-257 | 1 | 10 μF vertical | C605 |
| ( ) | B2 | 25-248 | 2 | 100 μF vertical | C604, C607 |
| ( ) | B2 | 25-164 | 1 | 1000 μF vertical | C603 |
| ( ) | B3 | 25-154 | 1 | 2500 μF tubular | C601 |

### Other Capacitors

| | | | | | |
|---|---|---|---|---|---|
| ( ) | B4 | 21-3 | 1 | 10 pF disc | C606 |
| ( ) | B4 | 21-46 | 1 | .005 μF disc | C406 |
| ( ) | B5 | 27-70 | 1 | .0022 μF Mylar* | C404 |
| ( ) | B5 | 27-73 | 2 | .047 μF Mylar | C401, C402 |

## DIODES–TRANSISTORS

| | | | | | |
|---|---|---|---|---|---|
| ( ) | C1 | 56-67 | 1 | VR-10A diode | ZD601 |
| ( ) | C1 | 57-65 | 4 | 1N4002 diode | D601, D602, D603, D604 |

NOTE: Transistors may be marked for identification in any of the following four ways:

1. Part number.
2. Type number.
3. Part number and type number.
4. Part number with a type number other than the one listed.

| | | | | | |
|---|---|---|---|---|---|
| ( ) | C2 | 417-91 | 2 | 2N5232A transistor | Q401, Q602 |
| ( ) | C3 | 417-809 | 1 | 2N3704 transistor | Q601 |

## MISCELLANEOUS

| | | | | | |
|---|---|---|---|---|---|
| ( ) | | 85-1401-3 | 1 | Power supply circuit board | |
| ( ) | | 85-1457-2 | 1 | Tone circuit board | |
| ( ) | D1 | 12-149 | 2 | Dual control | R402, R405 |
| ( ) | D2 | 254-4 | 2 | Control lockwasher | |
| ( ) | D3 | 255-89 | 2 | Control spacer | |

*Registered Trademark, DuPont Corp.

| KEY No. | PART No. | QTY. | DESCRIPTION | CIRCUIT Component No. |
|---|---|---|---|---|

## PARTS FROM THE FINAL PACK

### Wire-Cable-Sleeving

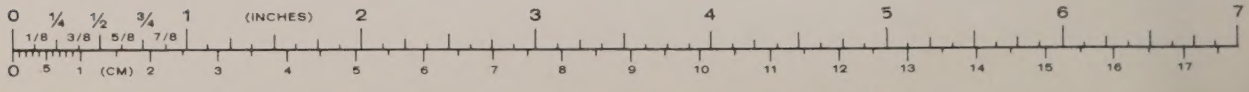
| | | | |
|---|---|---|---|
| ( ) | 343-15 | 54" | Shielded cable |
| ( ) | 347-2 | 18" | 300-ohm twin-lead |
| ( ) | 344-2 | 9" | Heavy black stranded wire |
| ( ) | 344-3 | 9" | Heavy red stranded wire |
| ( ) | 344-33 | 24" | Heavy black pretinned wire |
| ( ) | 344-36 | 6" | Heavy yellow pretinned wire |
| ( ) | 344-59 | 30" | White wire |
| ( ) | 344-90 | 66" | Small black stranded wire |
| ( ) | 344-92 | 66" | Small red stranded wire |
| ( ) | 344-115 | 48" | Small white-red stranded wire |
| ( ) | 346-1 | 6" | Small fiber sleeving |
| ( ) | 346-26 | 7" | Large clear sleeving |
| ( ) | 346-35 | 6" | Heat-shrinkable (medium) sleeving |

### Printed Material-Solder

| | | | |
|---|---|---|---|
| ( ) | 597-260 | 1 | Part Order Form |
| ( ) | 597-308 | 1 | Kit Builders Guide |
| ( ) | 597-1412 | 1 | Technical Consultant Letter |
| ( ) | | 1 | Assembly Manual (See front cover for part number.) |
| ( ) | | | Solder |

The prices shown on the separate "Heath Parts Price List" apply only on purchases from the Heath Company where shipment is to a U.S.A. destination. Add 10% (minimum 25 cents) to the price when ordering (Michigan residents add 4% sales tax) to cover insurance, postage, and handling. Outside the U.S.A., parts and service are available from your local Heathkit source and will reflect additional transportation, taxes, duties, and rates of exchange.

To order a replacement part, always include the PART NUMBER. Use the Parts Order Form furnished with this kit or at the rear of this Manual. If a Parts Order Form is not available, refer to "Replacement Parts" inside the rear cover. Your Warranty is inside the front cover. For prices, refer to the separate "Heath Parts Price List."



# STEP-BY-STEP ASSEMBLY

## TONE CIRCUIT BOARD

**START**

Position the tone circuit board as shown. Then proceed with the following steps.

( ) R409: 1000 Ω (brown-black-red).

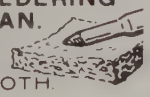
( ) R403: 15 kΩ (brown-green-orange).

( ) R406: 5600 Ω (green-blue-red).

( ) R401: 5600 Ω (green-blue-red).

( ) R404: 5600 Ω (green-blue-red).

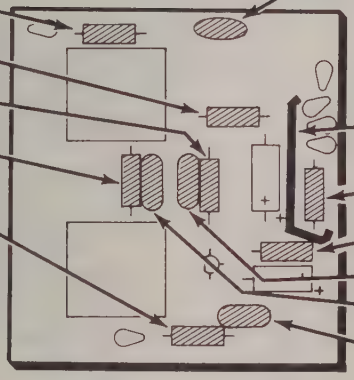
FOR GOOD SOLDER CONNECTIONS, YOU MUST **KEEP THE SOLDERING IRON TIP CLEAN.** WIPE IT OFTEN WITH A DAMP SPONGE OR CLOTH.



( ) Solder all the component leads to the foil.

SAFETY WARNING: Avoid eye injury when you clip off excess leads. We suggest that you wear glasses, or at least clip the leads so the ends will not fly toward your eyes.

( ) Cut the excess lead lengths from the foil side of the circuit board.



**CONTINUE**

NOTE: Before you install the following disc and Mylar capacitors, use long-nose pliers to remove the excess insulation from the capacitor leads.

REMOVE COATING EVEN WITH BOTTOM OF CAPACITOR BODY

( ) C406: .005 μF disc.

NOTE: To prepare a jumper wire as in the following steps, cut a white wire to the length indicated; then remove 1/4" of insulation from each wire end.

( ) 1-3/4" jumper wire. NOTE: Solder one end of the wire first. Then form the wire to the outline on the board and solder the remaining wire end.

( ) R408: 6800 Ω (blue-gray-red).

( ) R407: 2.2 MΩ (red-red-green).

( ) C402: .047 μF Mylar.

( ) C401: .047 μF Mylar.

( ) C404: .0022 μF Mylar.

( ) Solder the leads to the foil and cut off the excess lead lengths.

**PICTORIAL 1-1**

**START**

NOTE: Reposition the circuit board as shown in the Pictorial. Then proceed with the following steps.

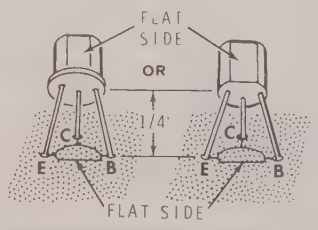
Position the positive (+) end of the following capacitors as shown.

( ) C405: 10 µF electrolytic.

( ) C403: 10 µF electrolytic.

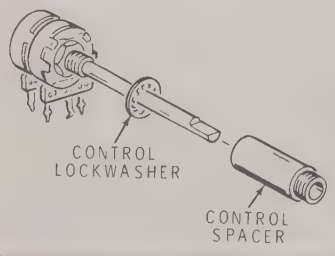
( ) Solder the leads to the foil and cut off the excess lead lengths.

NOTE: Install the following transistor as shown. Solder each lead to the foil and cut off the excess lead lengths.



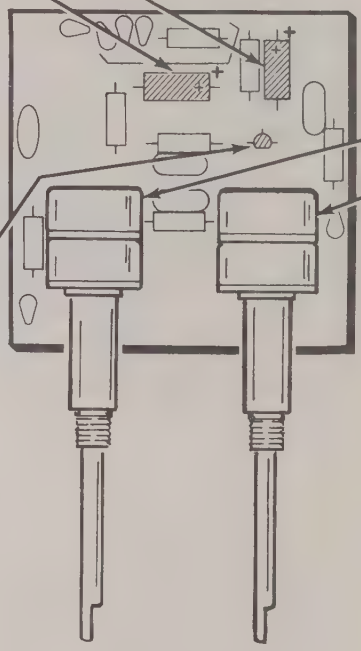

( ) Q401: 2N5232A (#417-91).

( ) Place a control lockwasher onto the shaft of a 50 kΩ dual control as shown. Then tightly twist a control spacer onto the control shaft.




( ) Turn the shaft of the control from one end to the other. If it binds anywhere, loosen the control spacer, reposition the lockwasher, and retighten the spacer. Then check the control again and, if necessary, repeat the process.

( ) Prepare another 50 kΩ dual control as described in the preceding step.



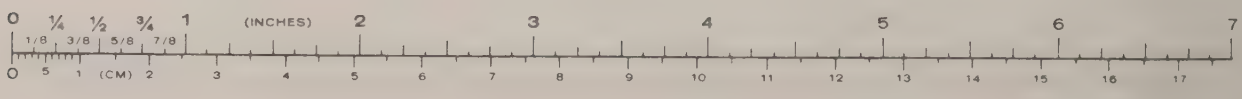
**CONTINUE**

NOTE: To install the controls in the following steps, position each control onto the circuit board as shown. Then apply solder to the center two lugs of each control on the foil side of the board. Turn the board over and check to see if the control is all the way down onto the top of the board. If not, reheat the soldered lugs while pressing firmly on the top of the control. When the control is tight against the surface of the board, solder the remaining control lugs.

( ) R402: 50 kΩ dual control.

( ) R405: 50 kΩ dual control.

**PICTORIAL 1-2**



## TONE CIRCUIT BOARD WIRING

Refer to Pictorial 1-3 (in the "Illustration Booklet") for the following steps.

NOTE: To prepare small stranded wires, as in the following step, cut each wire to the length indicated. Then remove 1/4" of insulation from each wire end, and tightly twist the wire end. Apply a small amount of solder to each bare wire to hold the strands together.

( ) Prepare the following lengths of small stranded wire:

| | |
|---|---|
| 29" black | 12" red |
| 5" black | 12" red |

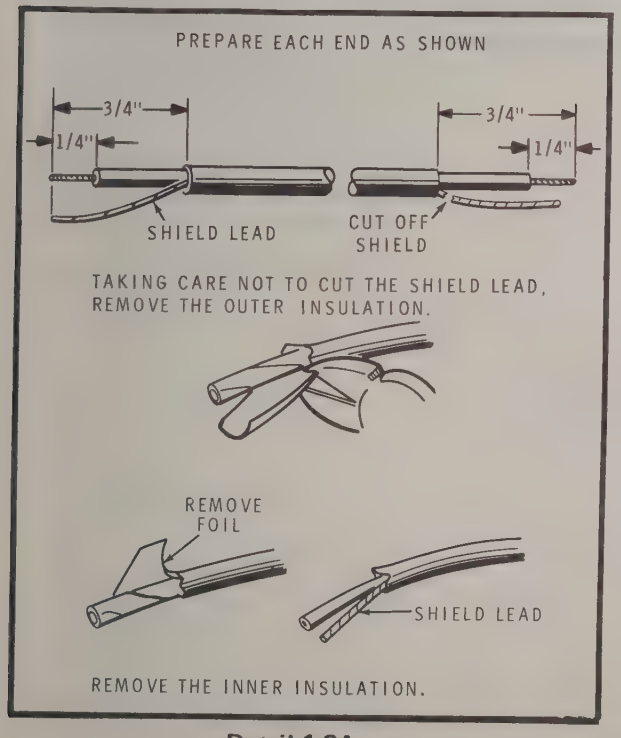
NOTE: As each of the following wires is connected to the tone circuit board, solder the wire end to the foil and cut off the excess wire length.

( ) 29" small black stranded wire to circuit board hole H.

( ) 5" small black stranded wire to circuit board hole Y.

( ) 12" small red stranded wire to circuit board hole T.

( ) 12" small red stranded wire to circuit board hole U.



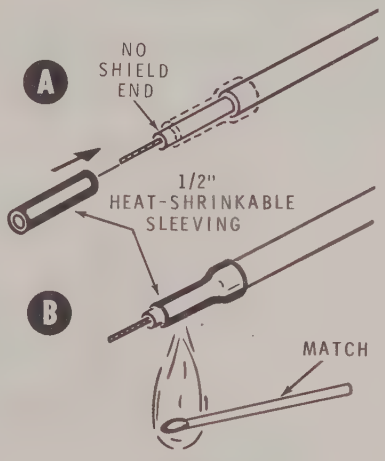

**Detail 1-3A**

( ) Refer to Detail 1-3A and prepare the following shielded cables as shown:

6-1/2"
13"

( ) Cut four 1/2" lengths of heat-shrinkable sleeving.

( ) Refer to Detail 1-3B and, on the end without a shield lead of each shielded cable, place a 1/2" length of heat-shrinkable sleeving, as shown. Light a kitchen match, a candle, or a lighter, and carefully shrink the sleeving around the cable end.




**Detail 1-3B**

As you install each of the shielded cables in the following steps, solder the leads to the foil and cut off the excess lead lengths.

( ) At the end of the 6-1/2" shielded cable without a shield lead, connect the inner lead to hole X in the circuit board.

( ) At the end of the 13" shielded lead without a shield lead, connect the inner lead to hole S in the circuit board.

NOTE: In the following steps you will put sleeving over wires and cables. This will be easier to accomplish if you slightly moisten the outer insulation of the wires and cables first.

NOTE: Do not shrink the heat-shrinkable sleeving used in the next two steps.

( ) Slide a 1/2" length of heat-shrinkable sleeving over the red wire coming from U, the black wire coming from Y, and the shielded cable coming from X on the circuit board. Position the sleeving approximately 1" from the edge of the board, as shown in the Pictorial.

( ) Similarly, slide a 1/2" length of heat-shrinkable sleeving over the remaining black wire, red wire, and shielded cable. Position these wires and cable as shown.

## CIRCUIT BOARD CHECKOUT

NOTE: Several circuit board holes will not be used.

Carefully inspect the circuit board for the following conditions.

( ) Unsoldered connections.

( ) "Cold" solder connections.

( ) Solder bridges between foil patterns. (To remove a solder bridge, see note #5 on Page 5.)

( ) Protruding leads which could touch together.

( ) Transistor for the proper type and installation.

( ) Electrolytic capacitors for the correct position of the positive (+) end.

Set the circuit board aside temporarily.

## POWER SUPPLY CIRCUIT BOARD

**START**

Position the power supply circuit board as shown. Then proceed with the following steps.

( ) Prepare a 2-3/4" white wire and a 1-1/4" white wire.

( ) 2-3/4" jumper.

( ) 1-1/4" jumper.

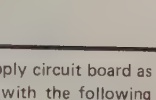
( ) R602: 100 Ω (brown-black-brown).

( ) R603: 100 Ω (brown-black-brown).

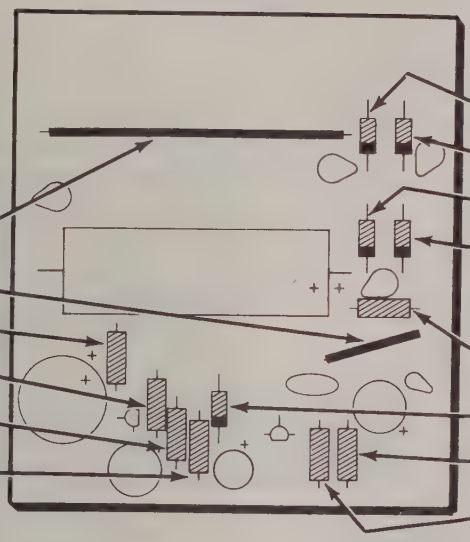
( ) R604: 3900 Ω (orange-white-red).

( ) R605: 1000 Ω (brown-black-red).

FOR GOOD SOLDER CONNECTIONS, YOU MUST **KEEP THE SOLDERING IRON TIP CLEAN.** WIPE IT OFTEN WITH A DAMP SPONGE OR CLOTH.



( ) Solder the leads to the foil and cut off the excess lead lengths.



**CONTINUE**

NOTE: When you install diodes, as in the following steps, be sure you position the banded end of each diode as shown on the circuit board.

( ) D601: 1N4002 diode (#57-65).

( ) D603: 1N4002 diode (#57-65).

( ) D602: 1N4002 diode (#57-65).

( ) D604: 1N4002 diode (#57-65).

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) R601: 100 Ω (brown-black-brown).

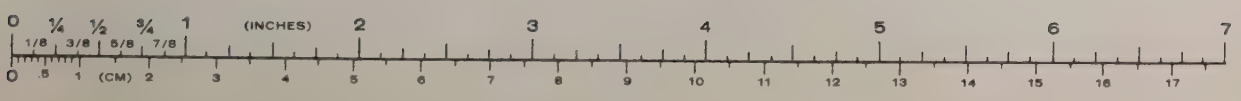
( ) ZD601: VR-10A diode (#56-67).

( ) R606: 1000 Ω (brown-black-red).

( ) R607: 3900 Ω (orange-white-red).

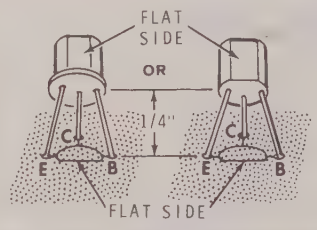
( ) Solder the leads to the foil and cut off the excess lead lengths.

**PICTORIAL 1-4**



**START**

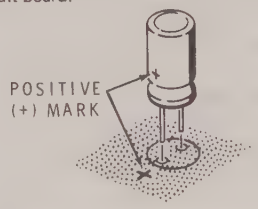
NOTE: Install each of the following transistors as shown. Solder each lead to the foil and cut off the excess lead lengths.




( ) Q602: 2N5232A transistor (#417-91).

( ) Q601: 2N3704 transistor (#417-809).

NOTE: When you install vertical electrolytic capacitors, be sure you match the positive (+) marking on the capacitor with the positive (+) marking on the circuit board.



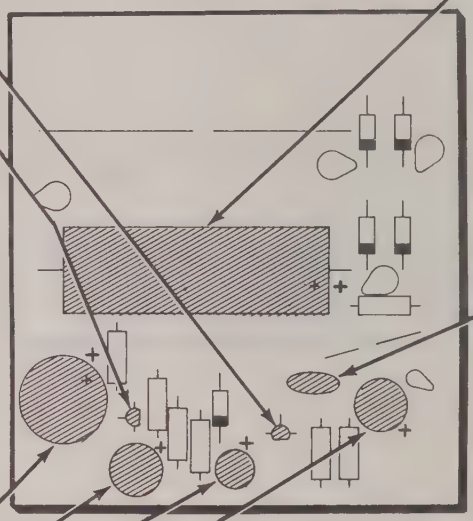

( ) C603: 1000 μF electrolytic.

( ) C604: 100 μF electrolytic.

( ) C605: 10 μF electrolytic.

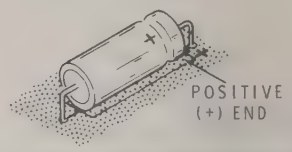
( ) C607: 100 μF electrolytic.

( ) Solder the leads to the foil and cut off the excess lead lengths.



**CONTINUE**

NOTE: Be sure to match the positive (+) marking on the following electrolytic capacitor with the positive (+) marking on the board.




( ) C601: 2500 μF electrolytic (#25-154).

NOTE: Before you install the following disc capacitor, use long-nose pliers to remove the excess insulation from the capacitor leads.

( ) C606: 10 pF disc. Solder the leads to the foil and cut off the excess lead lengths.

## CIRCUIT BOARD CHECKOUT

Carefully inspect the circuit board for the following conditions.

( ) Unsoldered connections.

( ) "Cold" solder connections.

( ) Solder bridges between foil patterns.

( ) Protruding leads which could touch together.

( ) Transistors for the proper type and installation.

( ) Electrolytic capacitors for the correct position of the positive (+) end.

( ) Diodes for the correct position of the banded end.

NOTE: There are several holes in the circuit board that will remain open.

Set the circuit board aside temporarily.

**PICTORIAL 1-5**

# AUDIO AMPLIFIER
# CIRCUIT BOARD

## PARTS LIST

Remove the parts from Pack #2 and check each part against the following list. Make a check (√) in the space provided as you identify each part. Any part that is packed in an individual envelope with the part number on it should be placed back in the envelope after you identify it until it is called for in a step. Do not throw away any packing materials until all parts are accounted for.

Refer to the proper "Parts Pictorial" in the "Illustration Booklet" to identify parts.

| | KEY No. | PART No. | QTY. | DESCRIPTION | CIRCUIT Component No. |
|---|---|---|---|---|---|
| **RESISTORS, 1/2-WATT** | | | | | |
| NOTE: A fourth color band of silver indicates 10% tolerance; a fourth band of gold indicates 5% tolerance. | | | | | |
| ( ) | A1 | 1-49 | 2 | 22 Ω (red-red-black) | R513, R517 |
| ( ) | A1 | 1-3 | 3 | 100 Ω (brown-black-brown) | R511, R512, R514 |
| ( ) | A1 | 1-45 | 1 | 220 Ω (red-red-brown) | R507 |
| ( ) | A1 | 1-9 | 1 | 1000 Ω (brown-black-red) | R501 |
| ( ) | A1 | 1-93 | 1 | 1800 Ω (brown-gray-red) | R509 |
| ( ) | A1 | 1-19 | 1 | 6800 Ω (blue-gray-red) | R506 |
| ( ) | A1 | 1-105 | 1 | 10 kΩ, 5% (brown-black-orange) | R505 |
| ( ) | A1 | 1-109 | 1 | 12 kΩ, 5% (brown-red-orange) | R508 |
| ( ) | A1 | 1-133 | 1 | 15 kΩ, 5% (brown-green-orange) | R502 |
| ( ) | A1 | 1-58 | 1 | 22 kΩ, 5% (red-red-orange) | R503 |
| ( ) | A1 | 1-76 | 1 | 33 kΩ, 5% (orange-orange-orange) | R504 |
| **Other Resistor** | | | | | |
| ( ) | A2 | 3-2-2 | 2 | .33 Ω, 5%, 2-watt (orange-orange-silver-gold) | R515, R516 |

| KEY No. | PART No. | QTY. | DESCRIPTION | CIRCUIT Component No. |
|---|---|---|---|---|

## CAPACITORS

### Electrolytic

| | | | | | |
|---|---|---|---|---|---|
| ( ) | B1 | 25-200 | 1 | .68 μF tantalum | C501 |
| ( ) | B1 | 25-834 | 1 | 22 μF tantalum | C505 |
| ( ) | B2 | 25-248 | 1 | 100 μF | C502 |
| ( ) | B2 | 25-818 | 1 | 500 μF | C508 |

### Other Capacitors

| | | | | | |
|---|---|---|---|---|---|
| ( ) | B3 | 21-7 | 1 | 33 pF disc | C504 |
| ( ) | B4 | 21-46 | 1 | .005 μF disc | C503 |
| ( ) | B5 | 27-47 | 2 | .1 μF Mylar | C506, C507 |

## DIODES–TRANSISTORS

| | | | | | |
|---|---|---|---|---|---|
| ( ) | C1 | 56-73 | 1 | MZ2360 diode | D502 |
| ( ) | C1 | 56-74 | 1 | MZ2362 diode | D501 |

NOTE: Transistors may be marked for identification in any of the following four ways:

1. Part number.
2. Type number.
3. Part number and type number.
4. Part number with a type number other than the one listed.

| | | | | | |
|---|---|---|---|---|---|
| ( ) | C2 | 417-91 | 2 | 2N5232A transistor | Q501, Q502 |
| ( ) | C2 | 417-94 | 1 | 2N3416 transistor | Q504 |
| ( ) | C2 | 417-201 | 2 | X29A829 transistor | Q503, Q505 |
| ( ) | C3 | 417-852 | 2 | TIP31B transistor | Q506, Q507 |

| | KEY No. | PART No. | QTY. | DESCRIPTION | CIRCUIT Component No. |
|---|---|---|---|---|---|

## HARDWARE

| | | | | |
|---|---|---|---|---|
| ( ) | D1 | 250-56 | 1 | 6-32 x 1/4" screw |
| ( ) | D2 | 250-89 | 2 | 6-32 x 3/8" screw |
| ( ) | D3 | 252-3 | 2 | 6-32 nut |
| ( ) | D4 | 253-2 | 2 | Fiber washer |
| ( ) | D5 | 254-1 | 4 | #6 lockwasher |
| ( ) | D6 | 255-185 | 1 | 7/16" spacer |

## MISCELLANEOUS

| | | | | |
|---|---|---|---|---|
| ( ) | | 85-1673-1 | 1 | Audio circuit board |
| ( ) | E1 | 75-152 | 2 | Insulator |
| ( ) | E2 | 215-98 | 1 | Heat sink |
| ( ) | E3 | 352-13 | 1 | Silicone grease |

The prices shown on the separate "Heath Parts Price List" apply only on purchases from the Heath Company where shipment is to a U.S.A. destination. Add 10% (mimimim 25 cents) to the price when ordering (Michigan residents add 4% sales tax) to cover insurance, postage, and handling. Outside the U.S.A., parts and service are available from your local Heathkit source and will reflect additional transportation, taxes, duties, and rates of exchange.

To order a replacement part, always include the PART NUMBER. Use the Parts Order Form furnished with this kit or at the rear of this Manual. If a Parts Order Form is not available, refer to "Replacement Parts" inside the rear cover. Your Warranty is inside the front cover. For prices, refer to the separate "Heath Parts Price List."

# STEP-BY-STEP ASSEMBLY

**START**

Position the audio circuit board as shown. Then proceed with the following steps.

( ) R509: 1800 Ω (brown-gray-red).

( ) R504: 33 kΩ (orange-orange-orange).

( ) R506: 6800 Ω (blue-gray-red).

( ) R508: 12 kΩ (brown-red-orange).

( ) R507: 220 Ω (red-red-brown).

( ) R517: 22 Ω (red-red-black).

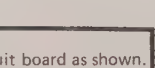
( ) R514: 100 Ω (brown-black-brown).

( ) R513: 22 Ω (red-red-black).

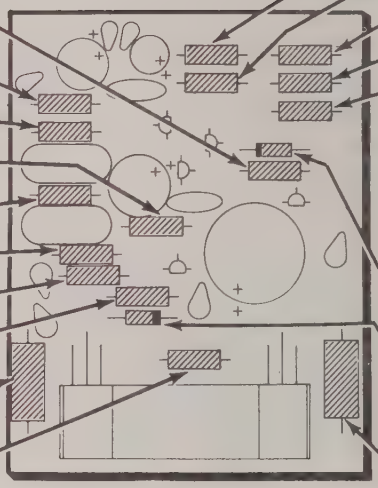
( ) R516: .33 Ω, 2-watt (orange-orange-silver-gold).

( ) R512: 100 Ω (brown-black-brown).

FOR GOOD SOLDER CONNECTIONS, YOU MUST **KEEP THE SOLDERING IRON TIP CLEAN.** WIPE IT OFTEN WITH A DAMP SPONGE OR CLOTH.



( ) Solder the leads to the foil and cut off the excess lead lengths.



**CONTINUE**

( ) R503: 22 kΩ (red-red-orange).

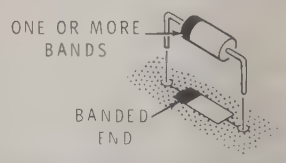
( ) R501: 1000 Ω (brown-black-red).

( ) R502: 15 kΩ (brown-green-orange).

( ) R505: 10 kΩ (brown-black-orange).

( ) R511: 100 Ω (brown-black-brown).

NOTE: When you install diodes, as in the following steps, be sure you position the banded end of each diode as shown on the circuit board. Refer to Detail 2-1A.



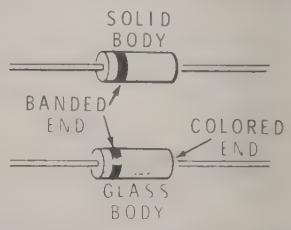

( ) D501: MZ2362 diode (#56-74).

( ) D502: MZ2360 diode (#56-73).

( ) R515: .33 Ω, 2-watt (orange-orange-silver-gold).

( ) Solder the leads to the foil and cut off the excess lead lengths.

**PICTORIAL 2-1**

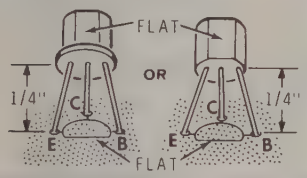



If your diode has a solid body, the band is clearly defined. If your diode has a glass body, do not mistake the colored end inside the diode for the banded end. Look for a band painted on the outside of the glass.

**Detail 2-1A**

## START

NOTE: Install each of the following transistors as shown. Solder each lead to the foil and cut off the excess lead lengths.




( ) Q503: X29A829 transistor (#417-201).

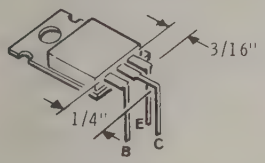
( ) Q501: 2N5232A transistor (#417-91).

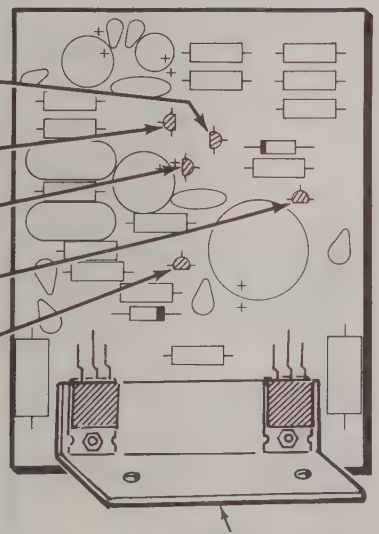
( ) Q502: 2N5232A transistor (#417-91).

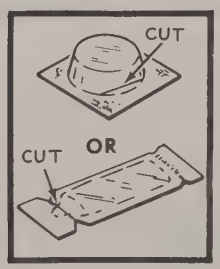
( ) Q504: 2N3416 transistor (#417-94).

( ) Q505: X29A829 transistor (#417-201).

( ) ( ) Form the leads of two TIP31B transistors (#417-852) as shown. Be sure the leads are bent to fit into the E, B, and C holes at Q506 or Q507. Do not mount these transistors yet.



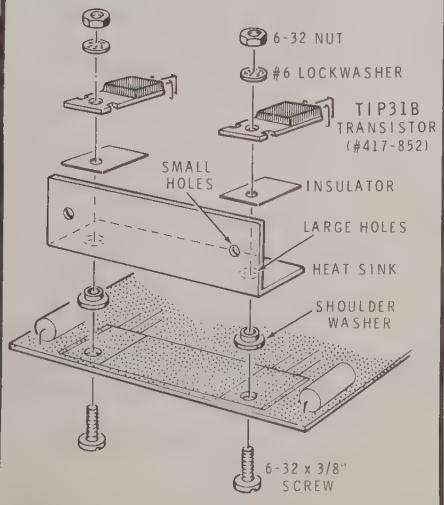

## CONTINUE

NOTE: First, read over the following steps as you study the drawing. Then perform the steps.

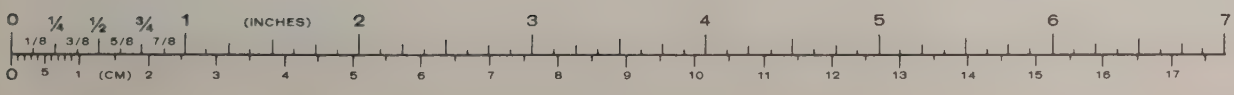
( ) Install two TIP31B transistors and the heat sink at Q506 and Q507 as follows:

1. Tape two 6-32 x 3/8" screws to the underside of the board.
2. Place shoulder washers onto the screws.
3. Position the heat sink onto the shoulder washers so the shoulders are centered in the larger heat sink holes.
4. Cut open the pod of grease. Then coat both sides of both insulators with this grease.
5. Place the insulators onto the heat sink so the holes fit over the screws.
6. Position the transistors onto the screws. Be sure all three E, C, and B leads fit into the circuit board holes.
7. Secure the transistor with #6 lockwashers and 6-32 nuts.
8. Solder all transistor leads to the foil and cut off the excess lengths.

NOTE: Save the remaining silicone grease; it will be used later.

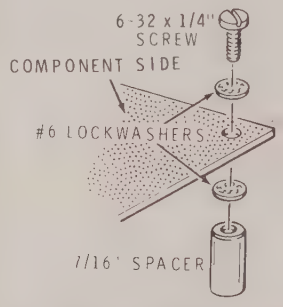



**PICTORIAL 2-2**



**START**

( ) 7/16" spacer. Use a 6-32 x 1/4" screw and two #6 lockwashers as shown.




NOTE: Before you install disc and Mylar capacitors, use long-nose pliers to remove the excess insulation from the capacitor leads.

REMOVE COATING EVEN WITH BOTTOM OF CAPACITOR BODY

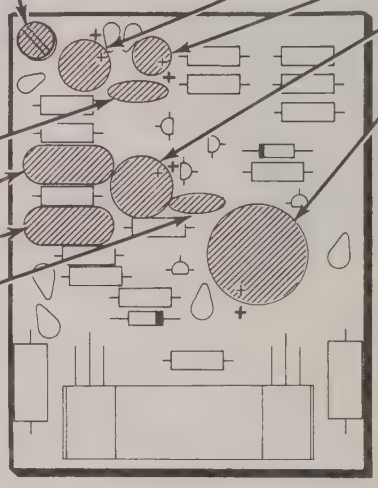
( ) C503: .005 μF disc.

( ) C506: .1 μF Mylar.

( ) C507: .1 μF Mylar.

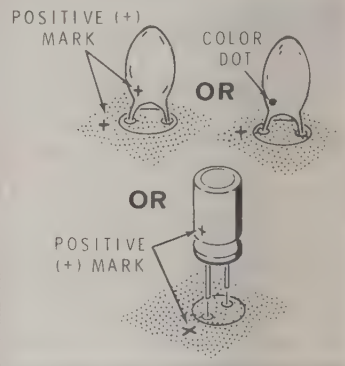
( ) C504: 33 pF disc.

( ) Solder the leads to the foil and cut off the excess lead lengths.



**CONTINUE**

NOTE: When you install tantalum and vertical electrolytic capacitors, be sure you match the positive (+) marking on the capacitor with the positive (+) marking on the circuit board.




( ) C502: 100 μF electrolytic.

( ) C501: .68 μF tantalum.

( ) C505: 22 μF tantalum.

( ) C508: 500 μF electrolytic.

## CIRCUIT BOARD CHECKOUT

Carefully inspect the circuit board for the following conditions.

( ) Unsoldered connections.

( ) "Cold" solder connections.

( ) Solder bridges between foil patterns.

( ) Protruding leads which could touch together.

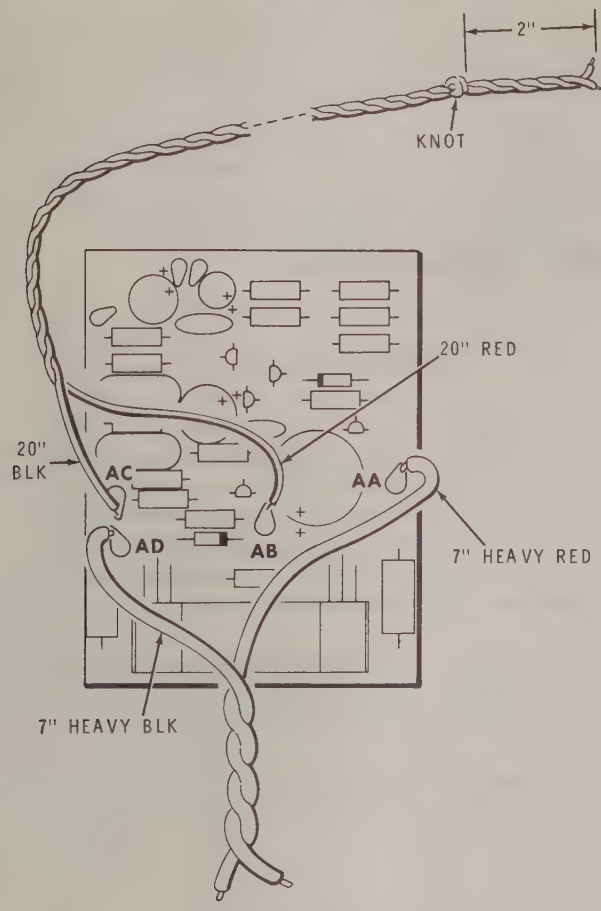
( ) Transistors for the proper type and installation.

( ) Electrolytic capacitors for the correct position of the positive (+) end.

( ) Diodes for the correct position of the banded end.

NOTE: There are several unused holes in the circuit board.

**PICTORIAL 2-3**




PICTORIAL 2-4

## CIRCUIT BOARD PREWIRING

Refer to Pictorial 2-4 for the following steps.

( ) Prepare a 20" length of small red stranded wire and a 20" length of small black stranded wire.

NOTE: As you install wires on the audio amplifier circuit board in the following steps, solder each wire to the foil and cut off the excess wire length.

( ) Connect one end of the 20" red wire to hole AB in the audio amplifier circuit board.

( ) Connect one end of the 20" black wire to hole AC in the board.

( ) Prepare a 7" heavy red stranded wire and a 7" heavy black stranded wire.

( ) Connect one end of a 7" heavy red stranded wire to circuit board hole AA.

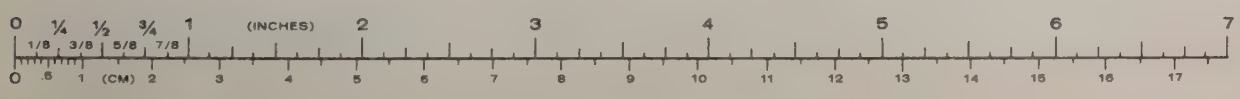
( ) Connect one end of a 7" heavy black stranded wire to circuit board hole AD.

( ) Twist the small red and black wires together and tie an overhand knot in the wires 2" from the free ends.

( ) Twist the heavy red and black wires together.

NOTE: The free ends of the wires you installed in this Pictorial will be connected later.

Set the circuit board aside temporarily.



# AM-FM CIRCUIT BOARD

## PARTS LIST

Remove the parts from Pack #3, and check each part against the following list. Make a check (✓) in the space provided as you identify each part. Any part that is packed in an individual envelope with the part number on it should be placed back in the envelope after you identify it until it is called for in a step. Do not throw away any packing materials until all parts are accounted for.

Refer to the proper "Parts Pictorial" in the "Illustration Booklet" to identify parts.

| | KEY No. | PART No. | QTY. | DESCRIPTION | CIRCUIT Component No. |
|---|---|---|---|---|---|

### RESISTORS, 1/2-WATT

NOTES:

1. The resistors may be packed in more than one envelope. Open all the resistor envelopes in this pack before you check them against the Parts List.

2. A fourth color band of silver indicates 10% tolerance; a fourth band of gold indicates 5% tolerance.

| | | | | | |
|---|---|---|---|---|---|
| ( ) | A1 | 1-1 | 1 | 47 Ω (yellow-violet-black) | R304 |
| ( ) | A1 | 1-3 | 3 | 100 Ω (brown-black-brown) | R321, R336, R339 |
| ( ) | A1 | 1-45 | 1 | 220 Ω (red-red-brown) | R333 |
| ( ) | A1 | 1-4 | 6 | 330 Ω (orange-orange-brown) | R306, R308, R318, R323, R335, R337 |
| ( ) | A1 | 1-6 | 1 | 470 Ω (yellow-violet-brown) | R307 |
| ( ) | A1 | 1-7 | 1 | 680 Ω (blue-gray-brown) | R305 |
| ( ) | A1 | 1-9 | 4 | 1000 Ω (brown-black-red) | R303, R319, R327, R345 |

| | KEY No. | PART No. | QTY. | DESCRIPTION | CIRCUIT Component No. |
|---|---|---|---|---|---|
| ( ) | A1 | 1-93 | 1 | 1800 Ω (brown-gray-red) | R328 |
| ( ) | A1 | 1-13 | 2 | 2700 Ω (red-violet-red) | R314, R315 |
| ( ) | A1 | 1-14 | 1 | 3300 Ω (orange-orange-red) | R338 |
| ( ) | A1 | 1-46 | 1 | 3900 Ω (orange-white-red) | R344 |
| ( ) | A1 | 1-16 | 3 | 4700 Ω (yellow-violet-red) | R312, R329, R331 |
| ( ) | A1 | 1-18 | 2 | 5600 Ω (green-blue-red) | R334, R341* |
| ( ) | A1 | 1-19 | 1 | 6800 Ω (blue-gray-red) | R302 |
| ( ) | A1 | 1-73 | 1 | 8200 Ω (gray-red-red) | R341 |
| ( ) | A1 | 1-20 | 2 | 10 kΩ (brown-black-orange) | R313, R324 |
| ( ) | A1 | 1-21 | 2 | 15 kΩ (brown-green-orange) | R309, R325 |
| ( ) | A1 | 1-58 | 1 | 22 kΩ, 5% (red-red-orange) | R317 |
| ( ) | A1 | 1-24 | 1 | 33 kΩ (orange-orange-orange) | R316 |
| ( ) | A1 | 1-25 | 2 | 47 kΩ (yellow-violet-orange) | R311, R332 |
| ( ) | A1 | 1-121 | 1 | 120 kΩ (brown-red-yellow) | R322 |
| ( ) | A1 | 1-27 | 1 | 150 kΩ (brown-green-yellow) | R343 |
| ( ) | A1 | 1-30 | 1 | 270 kΩ (red-violet-yellow) | R301 |
| ( ) | A1 | 1-34 | 1 | 680 kΩ (blue-gray-yellow) | R342 |
| ( ) | A1 | 1-35 | 1 | 1 MΩ (brown-black-green) | R346 |

## CAPACITORS

### Disc

| | | | | | |
|---|---|---|---|---|---|
| ( ) | B1 | 21-3 | 1 | 10 pF | C337 |
| ( ) | B1 | 21-7 | 1 | 33 pF | C333 |
| ( ) | B1 | 21-75 | 1 | 100 pF | C341 |
| ( ) | B1 | 21-46 | 2 | .005 μF | C307, C313 |
| ( ) | B1 | 21-143 | 15 | .05 μF | C301, C302, C305, C306, C323, C324, C325, C327, C331, C332, C334, C335, C336, C338, C342 |

### Electrolytic

| | | | | | |
|---|---|---|---|---|---|
| ( ) | B2 | 25-200 | 1 | .68 μF tantalum | C344 |
| ( ) | B2 | 25-834 | 1 | 22 μF (22 M) tantalum | C328 |
| ( ) | B2 | 25-223 | 1 | 47 μF tantalum | C326 |
| ( ) | B3 | 25-257 | 3 | 10 μF | C303, C309, C346 |
| ( ) | B3 | 25-248 | 1 | 100 μF | C345 |

*Optional – for use in European kits only.

| | KEY No. | PART No. | QTY. | DESCRIPTION | CIRCUIT Component No. |
|---|---|---|---|---|---|
| **Mylar** | | | | | |
| ( ) | B4 | 27-70 | 2 | .0022 μF | C308, C311 |
| ( ) | B4 | 27-69 | 1 | .0091 μF | C343 |
| ( ) | B4 | 27-47 | 1 | .1 μF | C312 |
| **Other Capacitors** | | | | | |
| ( ) | B5 | 20-161 | 1 | 68 pF mica | C321 |
| ( ) | B5 | 20-106 | 1 | 390 pF mica | C322 |
| **CONTROL-COILS-TRANSFORMERS** | | | | | |
| ( ) | C1 | 10-312 | 1 | 10 kΩ control | R326 |
| ( ) | C2 | 40-961 | 1 | Toroid coil | L301 |
| ( ) | C3 | 40-1779 | 1 | Rod antenna | T301 |
| ( ) | C4 | 52-154 | 1 | Quadrature detector coil | L302 |
| ( ) | C5 | 52-161 | 1 | AM IF transformer | T302 |
| **DIODES—TRANSISTORS—INTEGRATED CIRCUIT (IC)** | | | | | |
| ( ) | D1 | 56-26 | 3 | 1N191 diode (brown-white-brown) | D301, D302, D303 |
| ( ) | D1 | 56-56 | 2 | 1N4149 diode | D304, D305 |

NOTE: Transistors and integrated circuits (IC's) may be marked for identification in any of the following four ways:

1. Part number.
2. Type number. (On integrated circuits this refers only to the numbers; the letters may be different or missing.)
3. Part number and type number.
4. Part number with a type number other than the one listed.

| | | | | | |
|---|---|---|---|---|---|
| ( ) | D2 | 417 91 | 1 | 2N5232A transistor | Q307 |
| ( ) | D2 | 417-201 | 3 | X29A829 transistor | Q303, Q305, Q306 |
| ( ) | D2 | 417-801 | 3 | MPSA20 transistor | Q301, Q302, Q304 |
| ( ) | D3 | 442-28 | 2 | MC1357P IC | IC301, IC302 |

| | KEY No. | PART No. | QTY. | DESCRIPTION | CIRCUIT Component No. |
|---|---|---|---|---|---|

## MISCELLANEOUS

| | | | | | |
|---|---|---|---|---|---|
| ( ) | E1 | 207-18 | 2 | Cable clamp | |
| ( ) | E2 | 250-591 | 4 | #6 x 1/2" self-tapping screw | |
| ( ) | E3 | 254-1 | 2 | #6 lockwasher | |
| ( ) | E4 | 255-170 | 2 | 2-3/8" spacer | |
| ( ) | E5 | 266-867 | 1 | Shaft adapter | |
| ( ) | E6 | 404-399 | 2 | 455 kHz filter | FL301, FL302 |
| ( ) | E7 | 404-530-1 | 1 | Pair of 10.7 MHz filters | FL303, FL304 |
| ( ) | E8 | 434-240 | 2 | IC sockets | |
| ( ) | E9 | 466-26 | 1 | Dial pulley | |
| ( ) | E10 | 490-111 | 1 | IC puller | |

## PARTS FROM THE FINAL PACK

| | | | | |
|---|---|---|---|---|
| ( ) | | 85-1405-5 | 1 | AM-FM circuit board |
| ( ) | F1 | 110-73 | 1 | AM-FM tuner* |

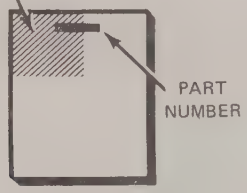
The prices shown on the separate "Heath Parts Price List" apply only on purchases from the Heath Company where shipment is to a U.S.A. destination. Add 10% (minimum 25 cents) to the price when ordering (Michigan residents add 4% sales tax) to cover insurance, postage, and handling. Outside the U.S.A., parts and service are available from your local Heathkit source and will reflect additional transportation, taxes, duties, and rates of exchange.

To order a replacement part, always include the PART NUMBER. Use the Parts Order Form furnished with this kit or at the rear of this Manual. If a Parts Order Form is not available, refer to "Replacement Parts" inside the rear cover. Your Warranty is inside the front cover. For prices, refer to the separate "Heath Parts Price List."

*If your old tuner is repairable, you can return it to the Heath Company for a credit or rebate against the cost of the replacement tuner (after you get the replacement tuner if you prefer). You can also return it to a Heathkit Electronic Center.

# STEP-BY-STEP ASSEMBLY

The steps performed in this Pictorial are in this area of the circuit board.




IDENTIFICATION DRAWING

**START**

Position the AM-FM circuit board as shown in the identification drawing. Then proceed with the following steps.

( ) R317: 22 kΩ (red-red-orange).

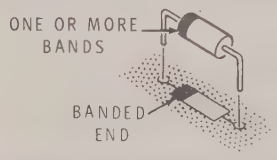
( ) R301: 270 kΩ (red-violet-yellow).

( ) R316: .33 kΩ (orange-orange-orange).

( ) R308: 330 Ω (orange-orange-brown).

( ) Solder the leads to the foil and cut off the excess lead lengths.

NOTE: When you install a diode, as in the following step, be sure you position the banded end as shown on the circuit board.



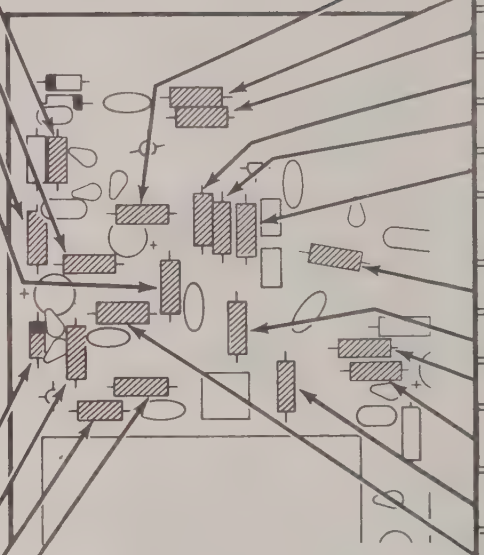

( ) D301: 1N191 diode (#56-26, brown-white-brown). Be sure to position the banded end as shown.

( ) R303: 1000 Ω (brown-black-red).

( ) R304: 47 Ω (yellow-violet-black).

( ) R305: 680 Ω (blue-gray-brown).

( ) Solder the leads to the foil and cut off the excess lead lengths.



**CONTINUE**

( ) R318: 330 Ω (orange-orange-brown).

( ) R314: 2700 Ω (red-violet-red).

( ) R313: 10 kΩ (brown-black-orange).

( ) R312: 4700 Ω (yellow-violet-red).

( ) R309: 15 kΩ (brown-green-orange).

( ) R311: 47 kΩ (yellow-violet-orange).

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) R319: 1000 Ω (brown-black-red).

( ) R307: 470 Ω (yellow-violet-brown).

( ) R345: 1000 Ω (brown-black-red).

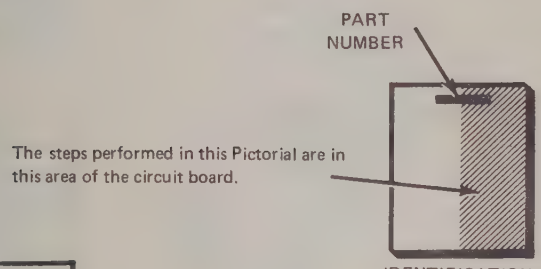
( ) R343: 150 kΩ (brown-green-yellow).

( ) R306: 330 Ω (orange-orange-brown).

( ) R302: 6800 Ω (blue-gray-red).

( ) Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 3-1




**START**

( ) Prepare the following white jumper wires; they will be used with this Pictorial.

| | |
|---|---|
| 1-1/2" | 1-3/4" |
| 1-1/4" | 1-3/4" |
| 1-1/2" | 2" |
| 1-1/2" | |

( ) 1-1/2" white jumper wire.

( ) R342: 680 kΩ (blue-gray-yellow).

( ) R341: 8200 Ω (gray-red-red).
NOTE: In Europe only:
( ) R341: 5600 Ω (green-blue-red).

( ) 1-1/4" white jumper wire.

( ) R327: 1000 Ω (brown-black-red).

( ) R329: 4700 Ω (yellow-violet-red).

( ) R331: 4700 Ω (yellow-violet-red).

( ) R325: 15 kΩ (brown-green-orange).

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) 1-1/2" white jumper wire.

( ) R328: 1800 Ω (brown-gray-red).

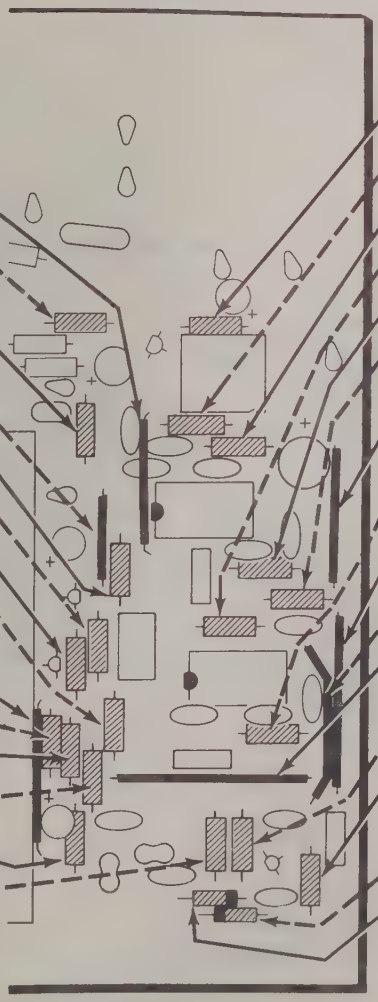
( ) R322: 120 kΩ (brown-red-yellow).

( ) R321: 100 Ω (brown-black-brown).

( ) R324: 10 kΩ (brown-black-orange).

( ) R333: 220 Ω (red-red-brown).

( ) Solder the leads to the foil and cut off the excess lead lengths.



**CONTINUE**

( ) R344: 3900 Ω (orange-white-red).

( ) R338: 3300 Ω (orange-orange-red).

( ) R339: 100 Ω (brown-black-brown).

( ) R335: 330 Ω (orange-orange-brown).

( ) R337: 330 Ω (orange-orange-brown).

( ) R336: 100 Ω (brown-black-brown).

( ) 1-1/2" white jumper wire.

( ) R323: 330 Ω (orange-orange-brown).

( ) 1-3/4" white jumper wire.

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) 1-3/4" white jumper wire.

( ) 2" white jumper wire.

( ) R332: 47 kΩ (yellow-violet-orange).

( ) R334: 5600 Ω (green-blue-red).

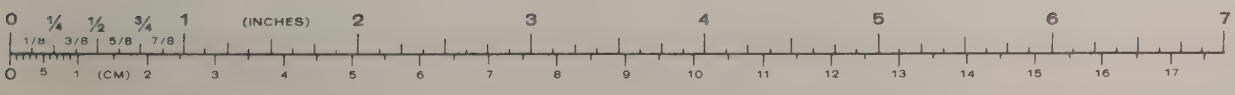
NOTE: When you install a diode, be sure you position the banded end as shown on the circuit board.

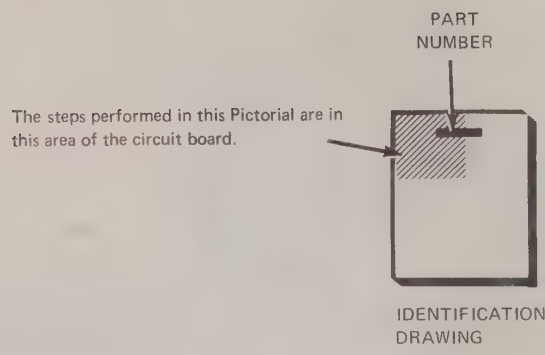
( ) D305: 1N4149 diode (#56-56).

( ) D304: 1N4149 diode (#56-56)

( ) Solder the leads to the foil and cut off the excess lead lengths.

**PICTORIAL 3-2**






**START**

( ) D303: 1N191 diode (#56-26, brown-white-brown).

( ) D302: 1N191 diode (#56-26, brown-white-brown).

NOTE: Before you install the following disc and Mylar capicitors, use long-nose pliers to remove the excess insulation from the capacitor leads.

REMOVE COATING EVEN WITH BOTTOM OF CAPACITOR BODY

( ) C308: .0022 μF Mylar.

( ) R315: 2700 Ω (red-violet-red).

( ) C307: .005 μF disc.

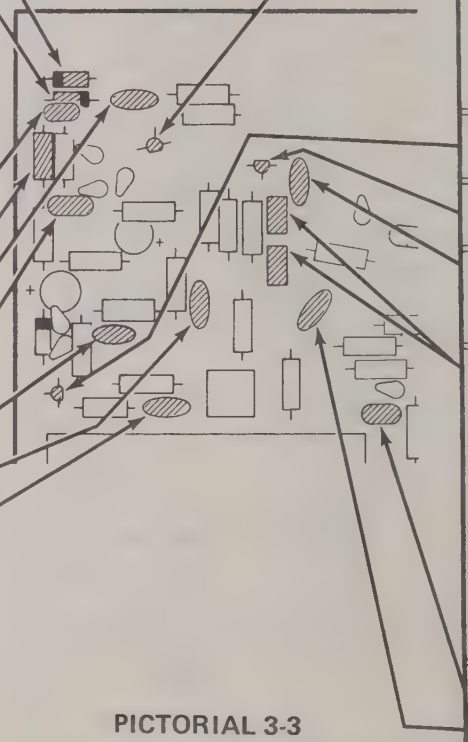
( ) C311: .0022 μF Mylar.

( ) C301: .05 μF disc.

( ) C305: .05 μF disc.

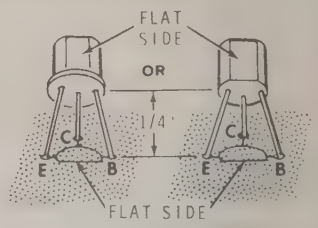
( ) C302: .05 μF disc.

( ) Solder the leads to the foil and cut off the excess lead lengths.



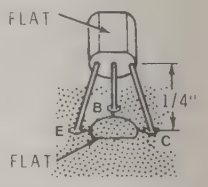
**CONTINUE**

NOTE: Install the following transistor as shown. Solder each lead to the foil and cut off the excess lead lengths.




( ) Q303: X29A829 transistor (#417-201).

NOTE: Install the following transistors as shown. Solder each lead to the foil and cut off the excess lead lengths.

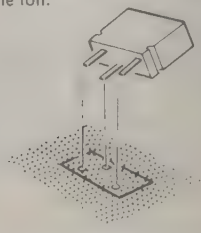



( ) Q301: MPSA20 transistor (#417-801).

( ) Q302: MPSA20 transistor (#417-801).

( ) C306: .05 μF disc. Solder the leads to the foil and cut off the excess lengths.

( ) FL301, FL302: 455 kHz ceramic filter (#404-399). Solder the lugs to the foil.



( ) C343: .0091 μF Mylar.

( ) C313: .005 μF disc.

( ) Solder the leads to the foil and cut off the excess lead lengths.

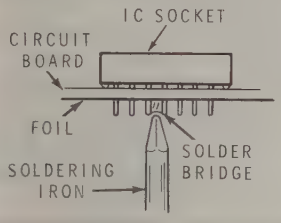
**PICTORIAL 3-3**

**START**

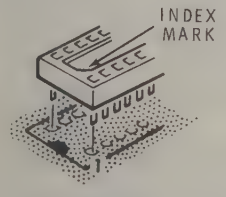
NOTE: Read this information carefully before you install the IC (integrated circuit) sockets in the following steps. First, be sure to position the socket as shown, with the index mark in one end near the pin "1" mark on the circuit board. Solder the pins of each socket when you install it.

Use a small-tip soldering iron if possible. The IC socket pins are very close together. Therefore, be sure you do not bridge solder between pins on different foils. When removing the soldering iron, move the tip of the iron straight up from the pin to avoid bridging solder to another pin. Do not place the soldering iron tip between the socket pins when soldering, as this increases the possibility of a solder bridge.

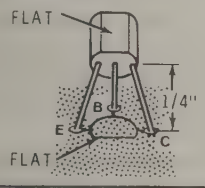
If a solder bridge does occur, turn the circuit board foil-side-down as shown, and hold the soldering iron tip between the two points that are bridged. The solder will flow down the soldering iron tip.




( ) IC sockets at IC302 and IC301.

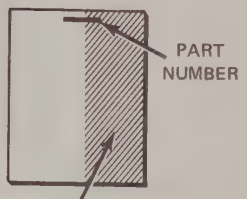



Install the following transistor as shown. Then solder its leads to the foil and cut off the excess lead lengths.

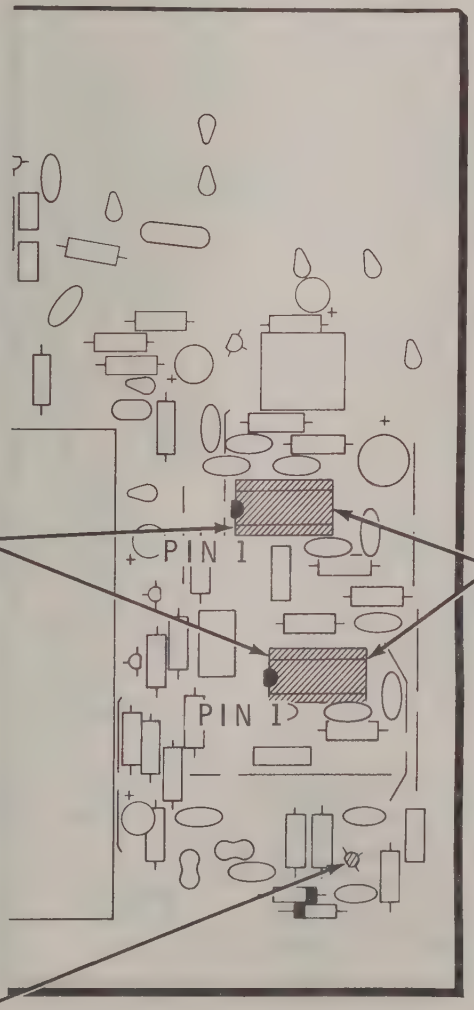



( ) Q304: MPSA20 transistor (#417-801).

IDENTIFICATION DRAWING




The steps performed in this Pictorial are in this area of the circuit board.

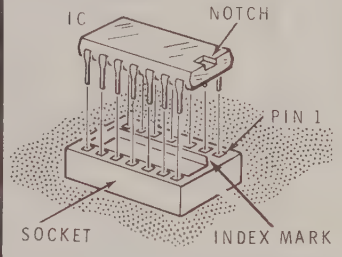



**CONTINUE**

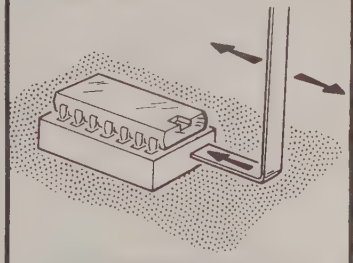
NOTE: Integrated circuits may be marked with a dot, dimple, small indentation, or ridge. See Detail 3-4A.

Install the IC as follows:

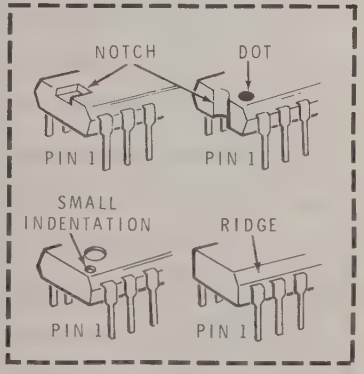
Refer to Detail 3-4A and match the pin 1 end of the IC with the dot on the board. Then insert the IC leads into the socket.




Should it ever become necessary to remove an IC from its socket, use the IC puller supplied with your kit. To use the puller, insert its foot beneath the IC; then gently rock the tool back and forth to lift the IC.

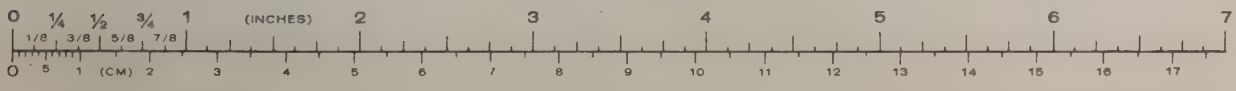


( ) IC301, IC302: MC1357P integrated circuits (#442-28).

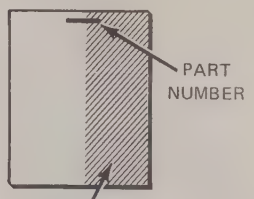



**Detail 3-4A**

**PICTORIAL 3-4**



IDENTIFICATION DRAWING



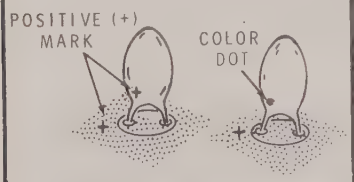

The steps performed in this Pictorial are in this area of the circuit board.

**START**

( ) C312: .1 μF Mylar.

NOTE: Tantalum capacitors may be marked two ways as shown. When you install the following capacitor, be sure to match the positive (+) sign or color dot with the positive (+) marking on the circuit board.

MAY BE MARKED WITH POSITIVE SIGN (+) OR COLOR DOT




( ) C344: .68 μF tantalum.

( ) C338: .05 μF disc.

( ) C341: 100 pF disc.

( ) C328: 22 μF tantalum.

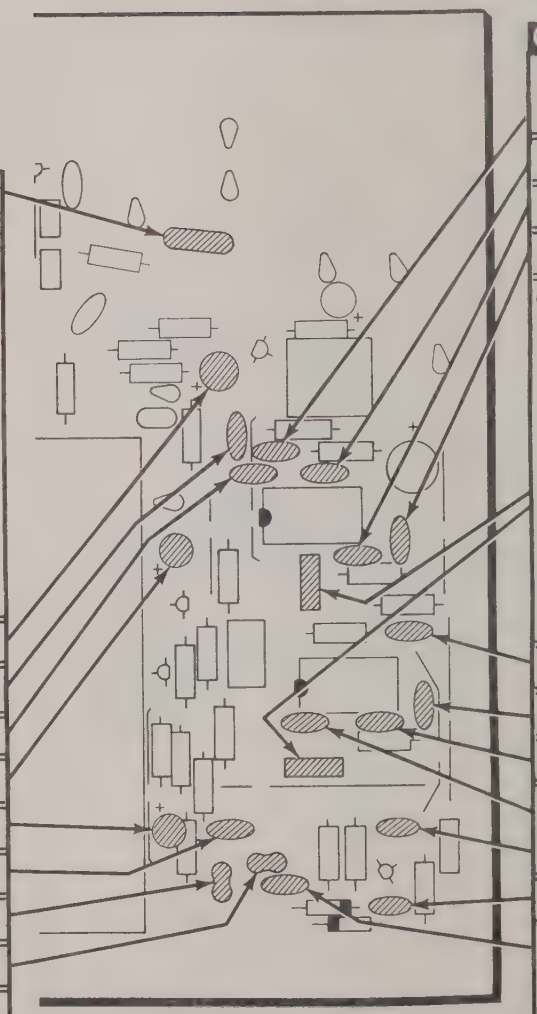
( ) C326: 47 μF tantalum.

( ) C323: .05 μF disc.

( ) C321: 68 pF mica.

( ) C322: 390 pF mica.

( ) Solder the leads to the foil and cut off the excess lead lengths.



**CONTINUE**

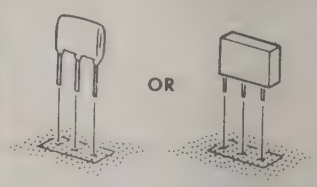
( ) C342: .05 μF disc. NOTE: Be sure the capacitor lead does not touch the adjacent jumper wire.

( ) C337: 10 pF disc.

( ) C336: .05 μF disc.

( ) C335: .05 μF disc.

( ) FL303, FL304: 10.7 MHz ceramic filter (#404-530-1) matched set. Solder the lugs to the foil. NOTE: These filters can be installed either way.




( ) C334: .05 μF disc.

( ) C325: .05 μF disc.

( ) C331: .05 μF disc.

( ) C324: .05 μF disc.

( ) C333: 33 pF disc.

( ) C332: .05 μF disc.

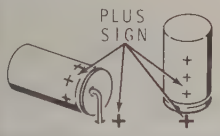
( ) C327: .05 μF disc.

( ) Solder the leads to the foil and cut off the excess lead lengths.

**PICTORIAL 3-5**

**START**

NOTE: When you install an electrolytic capacitor, always connect the lead at the positive (+) end of the capacitor to the positive (+) marked point on the circuit board.

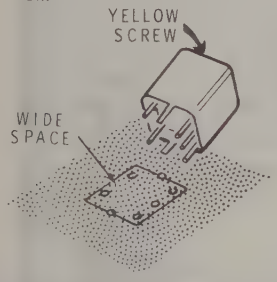



( ) C309: 10 µF electrolytic.

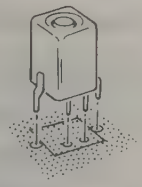
( ) C303: 10 µF electrolytic.

( ) C346: 10 µF electrolytic.

( ) T302: 455 kHz IF transformer (#52-161). Solder the lugs to the foil.

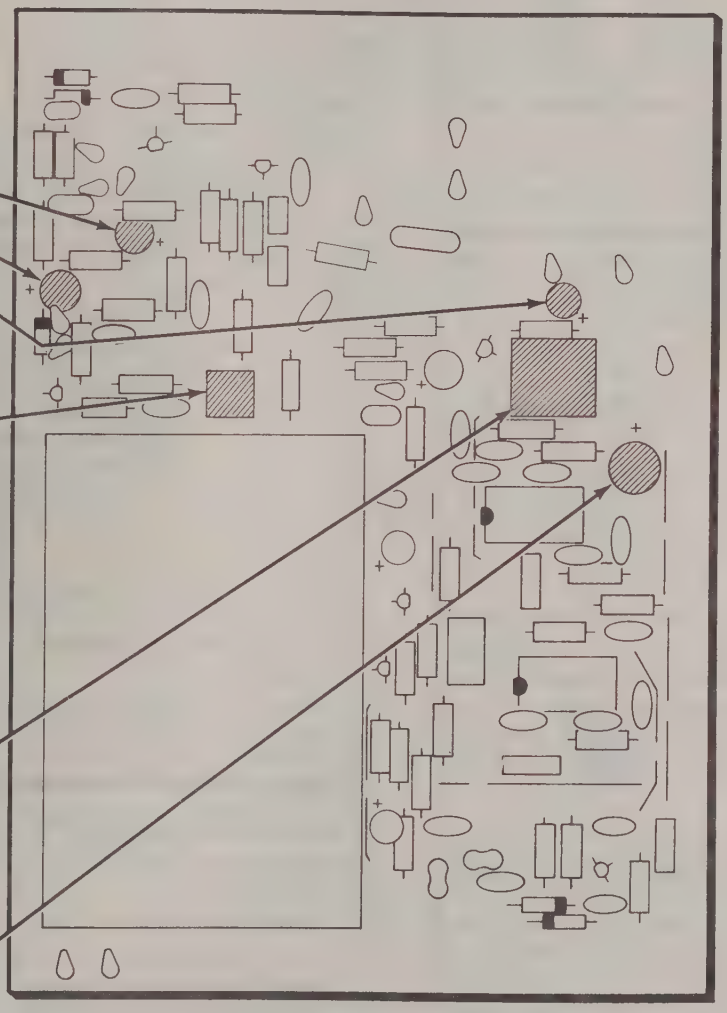



( ) L302: Quadrature detector coil (#52-154). Solder the lugs to the foil and cut off any excess lug lengths from the foil side.



( ) C345: 100 µF electrolytic. Position the positive (+) lead as shown.

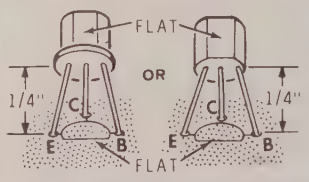
( ) Solder the leads to the foil and cut off the excess lead lengths.



**PICTORIAL 3-6**

**START**

NOTE: Install each of the following transistors as shown. Solder each lead to the foil and cut off the excess lead lengths.

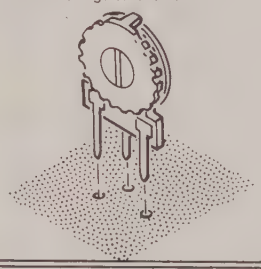



( ) Q307: 2N5232A transistor (#417-91).

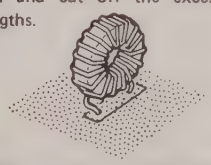
( ) Q306: X29A829 transistor (#417-201).

( ) Q305: X29A829 transistor (#417-201).

( ) R326: 10 kΩ control (#10-312). Solder the lugs to the foil.

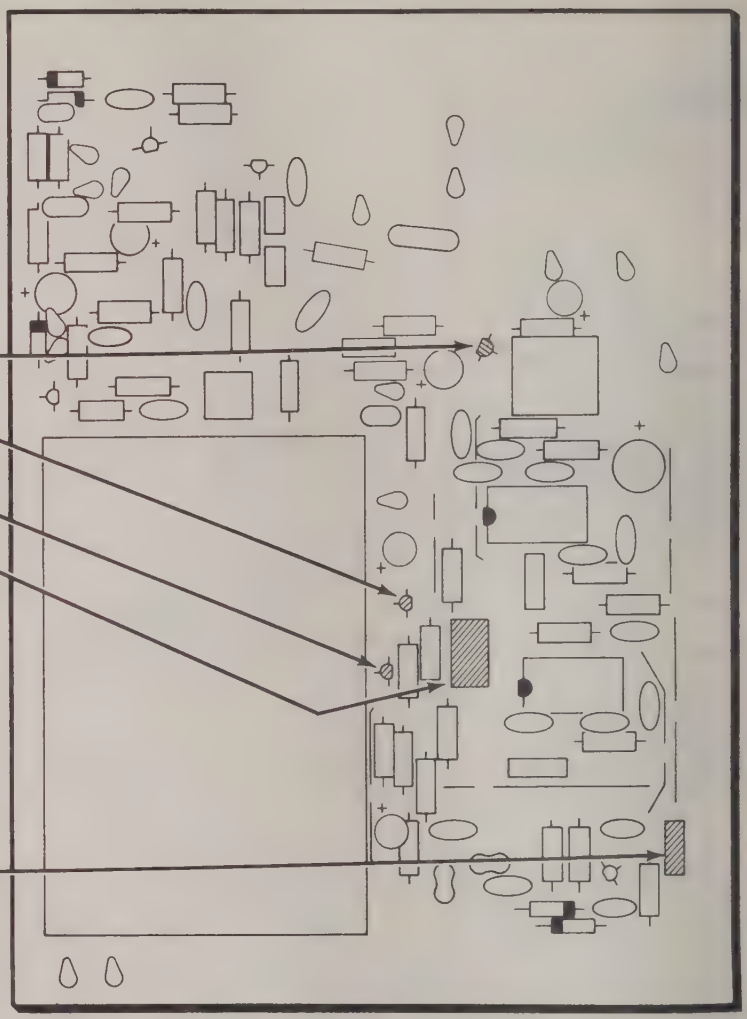


( ) L301: 100 µH toroid coil (#40-961). Solder the leads to the foil and cut off the excess lead lengths.



( ) Reposition the circuit board so the foil is facing up.

( ) R346: 1 MΩ (brown-black-green). Solder the resistor leads to the foil as shown in Detail 3-7A.



**CIRCUIT BOARD CHECKOUT**

Carefully inspect the circuit board for the following conditions.

( ) Unsoldered connections.

( ) "Cold" solder connections.

( ) Solder bridges between foil patterns.

( ) Protruding leads which could touch together.

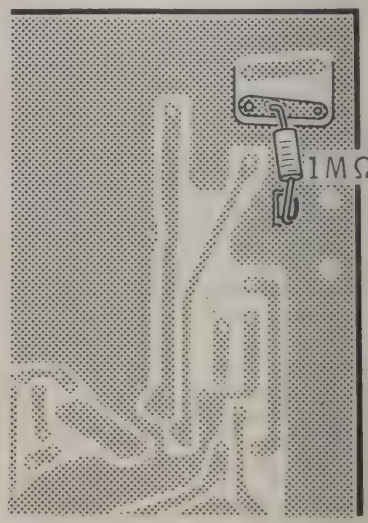
( ) Transistors for the proper type and installation.

( ) Electrolytic capacitors for the correct position of the positive (+) end.

( ) Diodes for the correct position of the banded end.

NOTE: There are a number of unused holes on the circuit board.

**PICTORIAL 3-7**




**Detail 3-7A**

## TUNER–ANTENNA INSTALLATION AND PREWIRING

Refer to Pictorial 3-8 (in the "Illustration Booklet") for the following steps.

Locate the AM-FM tuner and remove all the packing material from around it.

( ) Make sure the tuner shaft is turned fully counterclockwise so its plates are fully meshed. Leave the shaft in this position during assembly to avoid bending the plates. Be sure the twelve lugs on the underside of the tuner are all straight.

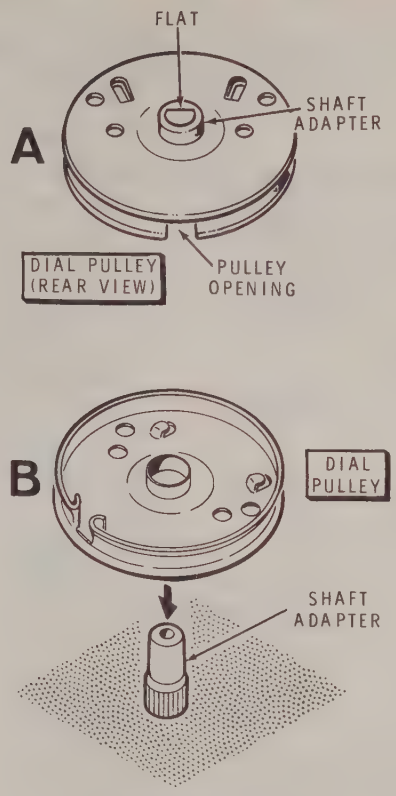
( ) Position the AM-FM circuit board and the tuner as shown in the Pictorial. Mount the tuner on the board by inserting the twelve lugs and the three mounting tabs through the top of the board. Make sure the mounting tabs are seated down onto the board. Turn the board over and solder the three tabs to the foil. Then solder the twelve lugs to the board.

( ) Refer to Parts A and B of Detail 3-8A. Position the shaft adapter into the rear of the dial pulley so the flat on the adapter is away from the pulley opening as shown.

( ) Turn the pulley and adapter right side up onto the surface of your work area and press the dial pulley firmly onto the shaft adapter.

( ) Match the flat on the pulley shaft adapter with the flat on the tuner shaft. Then firmly push the adapter as far as possible onto the tuner shaft.

( ) Mount two 2-3/8" spacers on the AM-FM circuit board at A and B as shown. Use a #6 x 1/2" self-tapping screw and a #6 lockwasher to secure each spacer. Place the lockwasher between the spacer and the top of the board as shown.

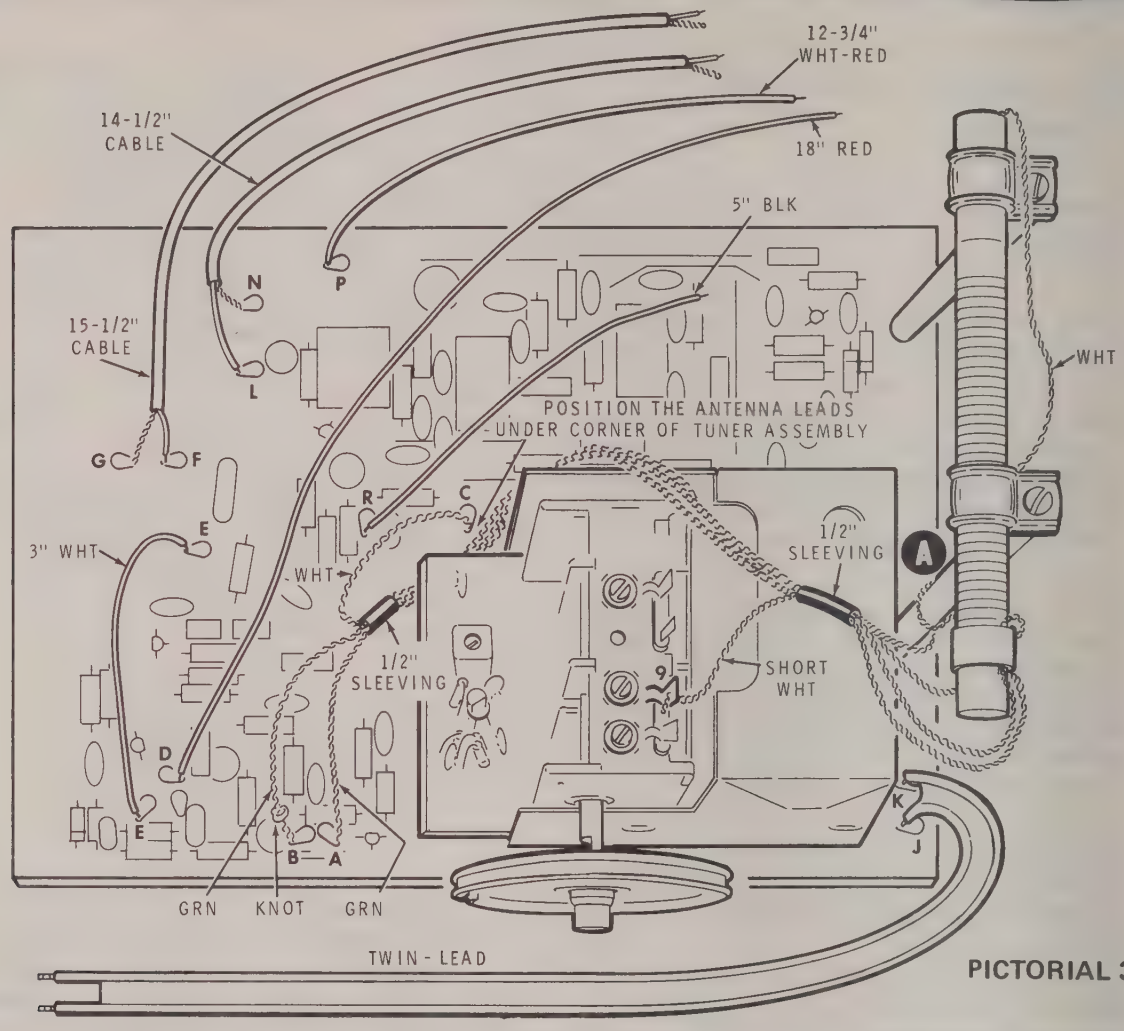



**Detail 3-8A**

( ) Place two cable clamps onto the rod antenna as shown in the Pictorial. Be sure the single white wire is at the end indicated in the drawing. Also be sure to position the holes in the cable clamps to match the spacing between spacers A and B.

( ) T301. Mount the rod antenna onto spacers A and B with two #6 x 1/2" screws as shown. Be sure not to get any of the antenna leads inside the clamps.

( ) Tie an overhand knot in the end of the indicated green antenna lead.




**PICTORIAL 3-9**

Refer to Pictorial 3-9 for the following steps.

( ) Cut two 1/2" lengths of heat-shrinkable (medium) sleeving.

( ) Locate the single white antenna lead. Pass this lead behind spacer A and wrap the lead, one turn, all the way around the spacer.

( ) Place a 1/2" length of heat-shrinkable sleeving over all four of the antenna leads as shown in the Pictorial. Do not shrink the sleeving.

( ) Connect the free end of the short white antenna lead to tuning capacitor lug 9 (S-1).

( ) Pass a 1/2" length of heat-shrinkable sleeving over the remaining three antenna leads. Do not shrink the sleeving.

NOTE: As you connect the antenna leads to the circuit board in the following steps, solder the leads to the foil and cut off the excess lead lengths.

( ) Connect the remaining white antenna lead to circuit board hole C.

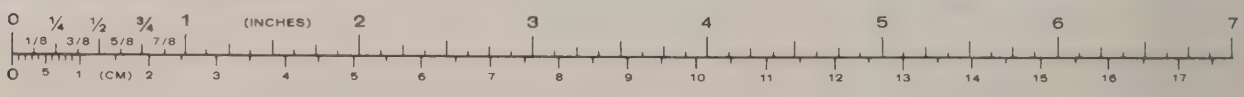
( ) Connect the green antenna lead with the small knot in the end to circuit board hole B.

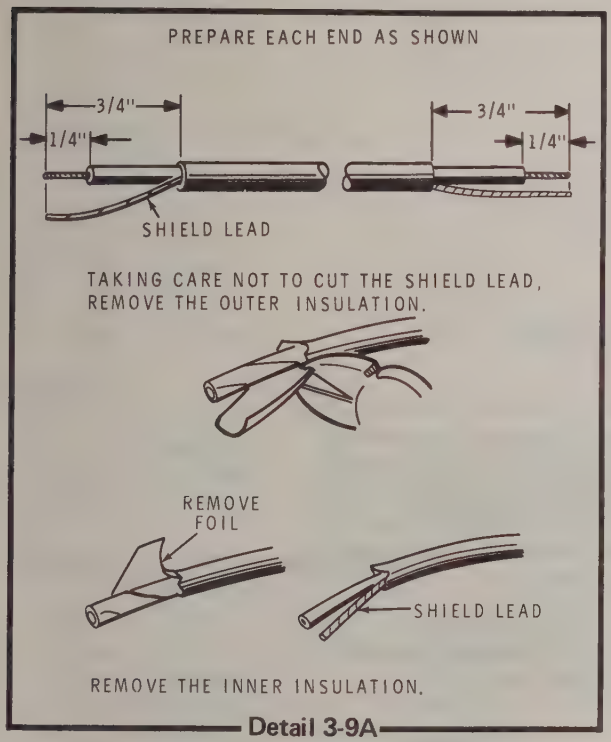
( ) Connect the remaining green antenna lead to circuit board hole A.

( ) Slide the sleeving on the antenna leads so it is positioned as shown in the Pictorial, and so the leads are under the corner of the tuner assembly and away from the movable capacitor plates.

( ) Refer to Detail 3-9A and prepare a 14-1/2" shielded cable as shown.

( ) Similarly, prepare one end of a 15-1/2" shielded cable.






**Detail 3-9A**

NOTE: As you install the shielded cables and wires on the circuit board in the following steps, solder the leads to the foil and cut off the excess lead lengths.

( ) At one end of the prepared 14-1/2" shielded cable, connect the inner lead to hole L and the shield lead to hole N in the AM-FM circuit board. The free end of the cable will be connected later.

( ) At the prepared end of the 15-1/2" shielded cable, connect the inner lead to hole F and the shield lead to hole G in the circuit board. The free end of this cable will be prepared and connected later.

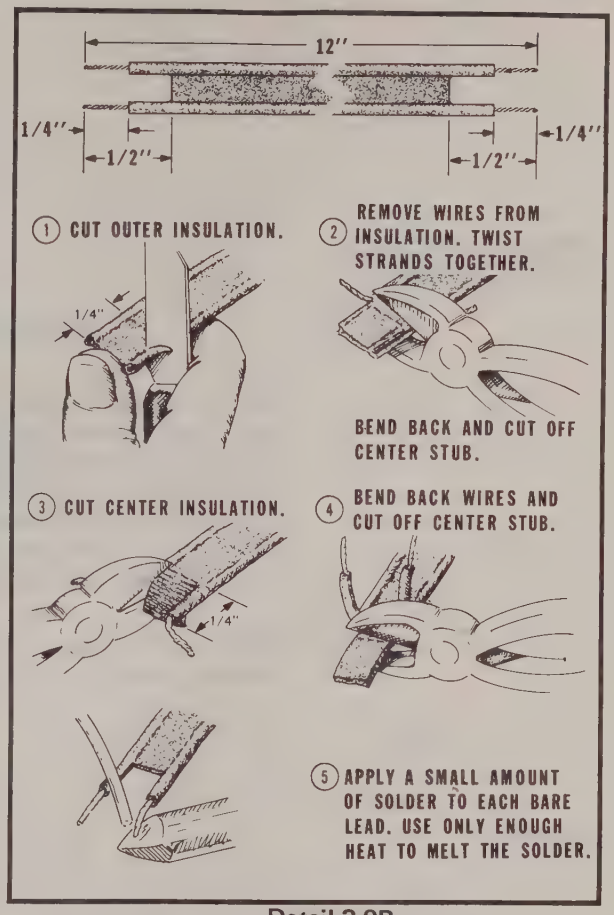
( ) Prepare the following lengths of small stranded wire:

12-3/4" white-red 5" black
18" red

( ) Connect one end of the 12-3/4" white-red wire to hole P in the circuit board. The free end will be connected later.

( ) Connect one end of an 18" red wire to hole D in the circuit board. The free end will be connected later.

( ) Connect one end of a 5" black wire to hole R in the circuit board. The free end will be connected later.


12"
1/4"
1/2"
1/2"
1/4"
1 CUT OUTER INSULATION.
1/4"
2 REMOVE WIRES FROM INSULATION. TWIST STRANDS TOGETHER.
BEND BACK AND CUT OFF CENTER STUB.
3 CUT CENTER INSULATION.
1/4"
4 BEND BACK WIRES AND CUT OFF CENTER STUB.
5 APPLY A SMALL AMOUNT OF SOLDER TO EACH BARE LEAD. USE ONLY ENOUGH HEAT TO MELT THE SOLDER.

**Detail 3-9B**

( ) Refer to Detail 3-9B and prepare a 12" length of 300 Ω twin-lead as shown.

( ) At one end of the twin-lead, connect either lead to hole J and the other lead to hole K in the circuit board. Solder both leads to the foil and cut off the excess lead lengths. The free ends of the twin-lead will be connected later.

( ) Prepare a 3" length of white wire.

( ) Install this 3" white wire on the AM-FM circuit board between the two holes marked "E." NOTE: One of the holes is near circuit board hole H, and the other is near hole F.

Set the AM-FM circuit board aside temporarily.

NOTE: You will have one resistor, either 8200Ω (gray-red-red) or 5600Ω (green-blue-red), left over. You may discard this resistor.

# CHASSIS

## PARTS LIST

Remove the parts from the Final Pack and check each part against the following list. Make a check (✓) in the space provided as you identify each part. Any part that is packed in an individual envelope with the part number on it should be placed back in the envelope after you identify it until it is called for in a step. Do not throw away any packing materials until all parts are accounted for.

Refer to the "Chassis Parts Pictorial" in the "Illustration Booklet" to identify parts.

| | KEY No. | PART No. | QTY. | DESCRIPTION | CIRCUIT Component No. |
|---|---|---|---|---|---|
| **GENERAL** | | | | | |
| ( ) | A1 | 1-38 | 1 | 3.3 MΩ (orange-orange-green) resistor | R2 |
| ( ) | A2 | 10-1062 | 1 | 25 kΩ slide control (with 2 screws) | R1 |
| ( ) | A3 | 21-70 | 2 | .01 μF capacitor | C1, C2 |
| ( ) | A4 | 25-188 | 1 | 4 μF non-polarized (N.P.) electrolytic capacitor | C3 |
| ( ) | A5 | 54-903 | 1 | Power transformer | T1 |
| ( ) | A6 | 63-1241 | 1 | Rotary switch | SW1 |
| ( ) | | 401-189 | 1 | Speaker | |
| ( ) | A7 | 421-31 | 1 | 3/16-ampere slow-blow fuse | F1 |
| ( ) | A8 | 422-1 | 1 | Fuseholder | |
| **METAL PARTS** | | | | | |
| ( ) | B1 | 200-1241 | 1 | Left-half chassis | |
| ( ) | B2 | 200-1242 | 1 | Right-half chassis | |
| ( ) | B3 | 204-2137 | 1 | Control bracket | |
| ( ) | B4 | 206-1197 | 1 | Metallic shield | |
| ( ) | B5 | 453-267 | 1 | Dial shaft | |
| ( ) | B6 | 455-26 | 1 | Shaft bushing | |

| KEY No. | PART No. | QTY. | DESCRIPTION | CIRCUIT Component No. |
|---|---|---|---|---|

## GROMMETS—PLASTIC PARTS

| | | | | |
|---|---|---|---|---|
| ( ) | C1 | 73-1 | 2 | 3/8" rubber grommet |
| ( ) | C2 | 73-4 | 1 | 5/16" rubber grommet |
| ( ) | C3 | 75-24 | 1 | Strain relief |
| ( ) | C4 | 207-5 | 1 | Cable clamp |
| ( ) | C5 | 463-66 | 1 | Dial pointer |
| ( ) | C6 | 261-28 | 4 | Plastic foot |

## KNOBS

| | | | | |
|---|---|---|---|---|
| ( ) | D1 | 462-913 | 3 | Round knob with pointer |
| ( ) | D2 | 462-963 | 1 | Round knob without pointer |
| ( ) | D3 | 462-917 | 1 | Slide control knob |

## TERMINAL STRIPS—CONNECTORS

| | | | | |
|---|---|---|---|---|
| ( ) | E1 | 431-8 | 1 | 3-screw terminal strip |
| ( ) | E2 | 431-42 | 1 | 5-lug terminal strip |
| ( ) | E3 | 432-199 | 1 | Wire nut (240-VAC option) |
| ( ) | E4 | 432-720 | 1 | 3-pin socket |
| ( ) | E5 | 432-723 | 1 | 3-pin plug |

## HARDWARE

NOTE: Hardware packets are marked to show the size of the hardware they contain (HDW #6, etc.). You may have to open more than one packet to locate all the hardware of any one size.

### #6 Hardware

| | | | | |
|---|---|---|---|---|
| ( ) | F1 | 250-56 | 5 | 6-32 x 1/4" screw |
| ( ) | F2 | 250-597 | 13 | #6 x 3/8" self-tapping screw |
| ( ) | F3 | 250-89 | 2 | 6-32 x 3/8" screw |
| ( ) | F4 | 250-26 | 4 | 6-32 x 5/8" screw |
| ( ) | F5 | 250-1173 | 2 | 6-32 x 7/8" screw |
| ( ) | F6 | 252-3 | 2 | 6-32 nut |
| ( ) | F7 | 252-22 | 4 | #6 spring nut |
| ( ) | F8 | 253-89 | 1 | D-washer |
| ( ) | F9 | 253-127 | 4 | #6 flat washer |
| ( ) | F10 | 254-1 | 12 | #6 lockwasher |
| ( ) | F11 | 259-1 | 1 | #6 solder lug |

### Other Hardware

| | | | | |
|---|---|---|---|---|
| ( ) | G1 | 250-82 | 2 | #4 x 1/2" wood screw |
| ( ) | G2 | 252-4 | 4 | 8-32 nut |
| ( ) | G3 | 252-7 | 4 | Control nut |

| KEY No. | PART No. | QTY. | DESCRIPTION | CIRCUIT Component No. |
|---|---|---|---|---|

### Other Hardware (cont'd.)

| | | | | |
|---|---|---|---|---|
| ( ) | G4 | 253-10 | 3 | Control flat washer |
| ( ) | G5 | 253-11 | 2 | E-washer |
| ( ) | G6 | 254-4 | 2 | Control lockwasher |
| ( ) | G7 | 254-28 | 5 | #8 lockwasher |
| ( ) | G8 | 258-103 | 1 | Dial spring |
| ( ) | G9 | 259-24 | 1 | #8 solder lug |
| ( ) | G10 | 259-25 | 1 | Double-loop lug |
| ( ) | G11 | 255-83 | 4 | 3/4" spacer |
| ( ) | G12 | 432-66 | 4 | Push-on connector |
| ( ) | G13 | 432-861 | 3 | Male connector pin |
| ( ) | G14 | 432-873 | 3 | Female connector pin |

### MISCELLANEOUS

| | | | | |
|---|---|---|---|---|
| ( ) | | 89-45 | 1 | AC line cord |
| ( ) | | 91-272 | 1 | Wood cabinet |
| ( ) | H1 | 100-1669 | 1 | Dial cord assembly |
| ( ) | H2 | 264-14 | 5 | Thumbtack |
| ( ) | H3 | 490-109 | 1 | Alignment tool |

### LABELS

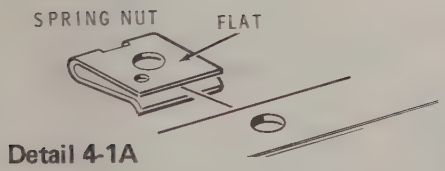
NOTE: Be sure you refer to the numbers on the blue and white label in any communications you may have about this kit with Heath Company. You may want to write the model and series numbers in this sample for future convenience.

| | | | | |
|---|---|---|---|---|
| ( ) | J1 | 391-34 | 1 | Blue and white label |
| ( ) | J2 | 390-1255 | 1 | Fuse label |
| ( ) | J3 | 390-1205 | 1 | Embossed nameplate |
| ( ) | J4 | 390-1206 | 1 | Dial plate |
| ( ) | | 390-1163 | 1 | FCC label |
| ( ) | J5 | 390-1207 | 1 | Calibration label |
| ( ) | J6 | 390-1227 | 1 | Rear panel instruction label |

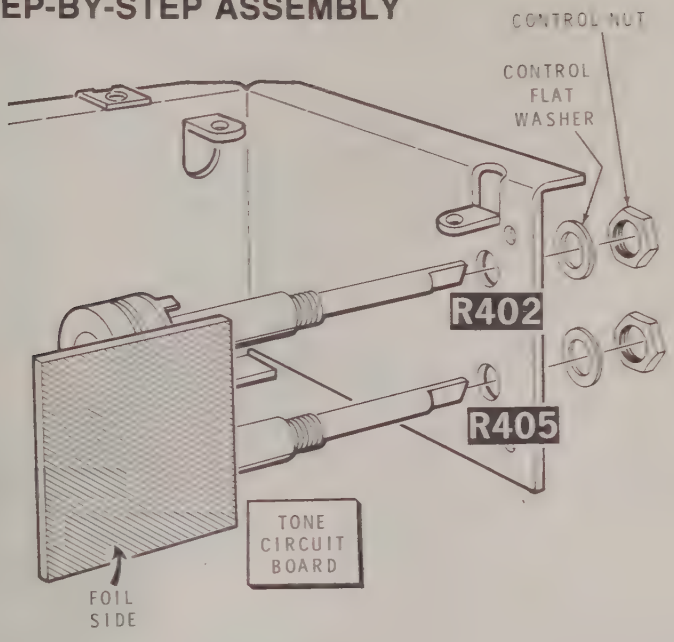
The prices shown on the separate "Heath Parts Price List" apply only on purchases from the Heath Company where shipment is to a U.S.A. destination. Add 10% (minimum 25 cents) to the price when ordering (Michigan residents add 4% sales tax) to cover insurance, postage, and handling. Outside the U.S.A., parts and service are available from your local Heathkit source and will reflect additional transportation, taxes, duties, and rates of exchange.

To order a replacement part, always include the PART NUMBER. Use the Parts Order Form furnished with this kit or at the rear of this Manual. If a Parts Order Form is not available, refer to "Replacement Parts" inside the rear cover. Your Warranty is inside the front cover. For prices, refer to the separate "Heath Parts Price List."

## STEP-BY-STEP ASSEMBLY




Detail 4-1A




Detail 4-1B

### LEFT-HALF CHASSIS

Refer to Pictorial 4-1 (in the "Illustration Booklet") for the following steps.

( ) Install two 3/8" rubber grommets in left half chassis holes AA and AB. NOTE: Holes AA and AB are those formed by the bent-out mounting tabs.

( ) Push two #6 spring nuts onto the lower chassis flange at AC and AD as shown in Detail 4-1A. Be sure to position the flat portion of the nut onto the underside of the flange (upward as shown in the illustrations). Center the spring nuts over the chassis holes with the tip of your long-nose pliers (closed) or with another suitable round tool.

( ) Refer to Detail 4-1B and position the tone circuit board control shafts through the front of the chassis at R405 and R402 as shown. Secure the control spacers to the chassis panel with two control flat washers and two control nuts. NOTE: Be sure to position the foil side of the circuit board toward the open side of the chassis.

Refer to Detail 4-1C (in the "Illustration Booklet") for the next three steps.

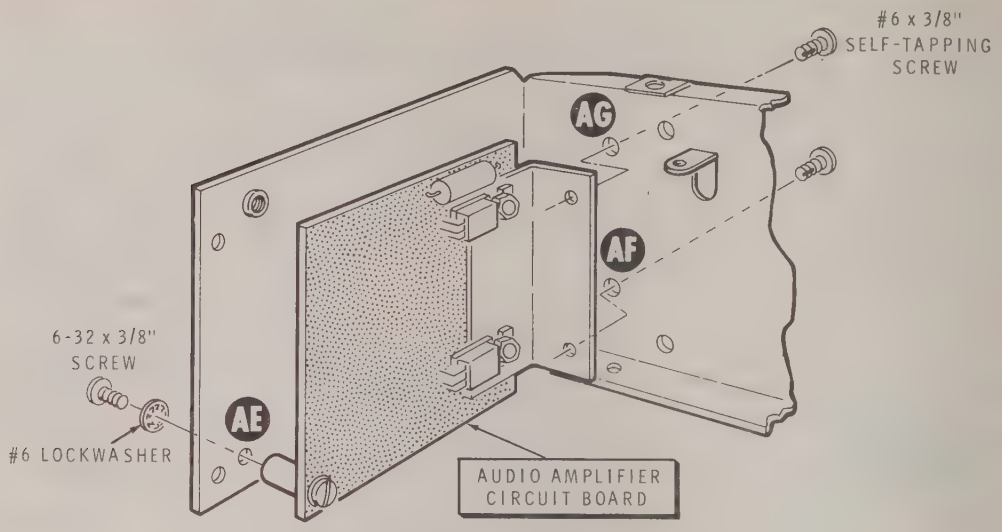
NOTE: As you connect the following wires to the audio amplifier circuit board, solder each wire to the foil and cut off the excess wire length.

( ) Position the audio amplifier circuit board close to the chassis and the tone circuit board.

( ) Locate the shielded cable coming from hole X on the tone board. Connect the inner lead to hole X and the shield lead to hole Z on the audio amplifier circuit board.

( ) Connect the small black wire coming from Y on the tone board to hole Y on the audio amplifier circuit board.

NOTE: The small red wire will be connected later.




**Detail 4-1D**

( ) Refer to Detail 4-1D and position the audio amplifier circuit board into the rear of the chassis as shown. Loosely secure the spacer on the foil side of the board to the chassis rear panel at AE with a #6 lockwasher and a 6-32 x 3/8" screw.

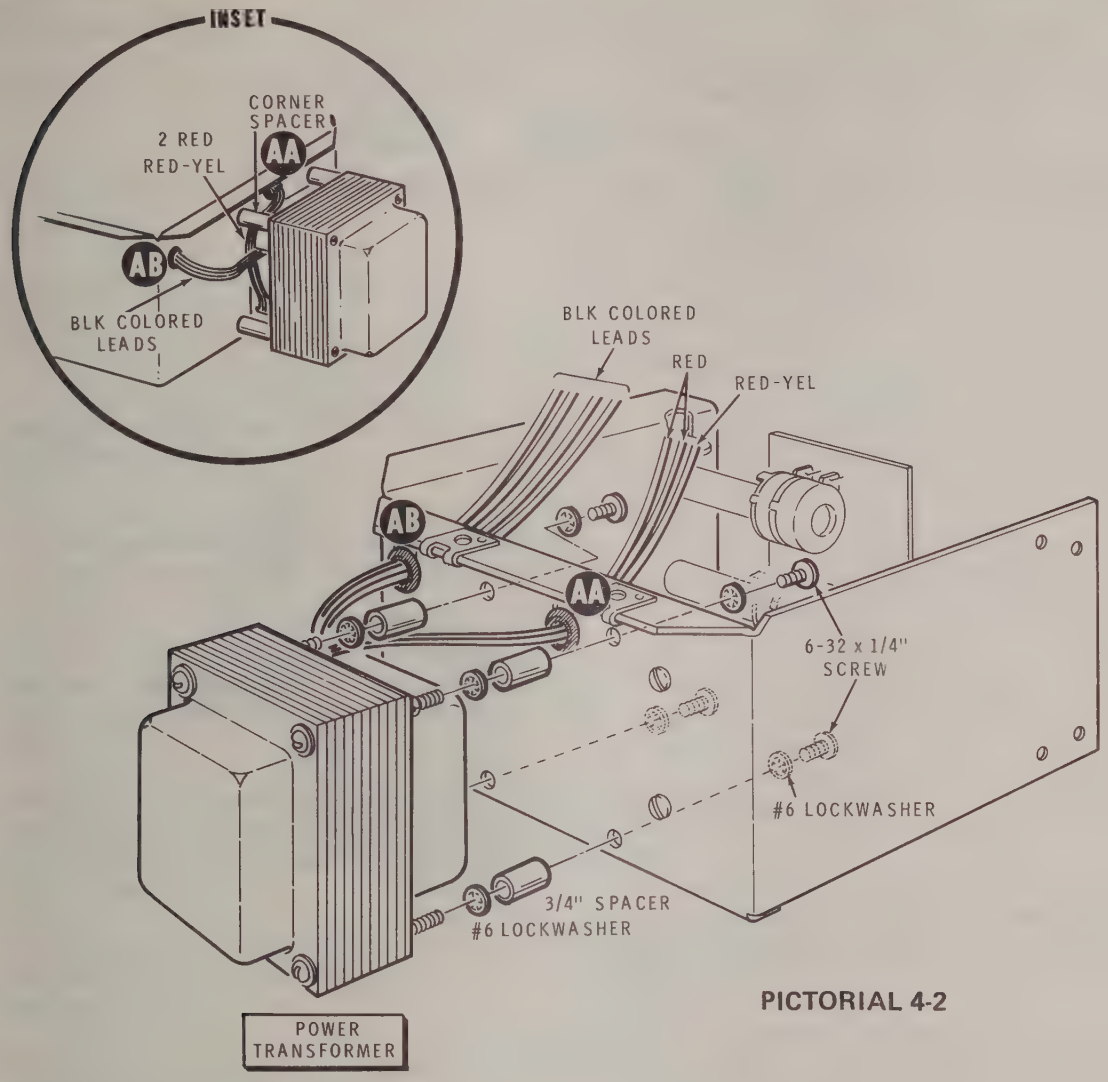
( ) Secure the audio amplifier heat sink to the left chassis panel with #6 x 3/8" self-tapping screws at AF and AG. NOTE: Start both screws into the heat sink before you tighten them.

( ) Tighten all three audio amplifier mounting screws.

( ) Pass the small red and black twisted wires coming from the audio amplifier through chassis grommet AA; they will be connected later.

( ) Locate the fuse label and write "3/16 A., S.B." (3/16-ampere, slow-blow) in the space provided on it.

( ) Remove the paper backing from the fuse label and press the label in place on the lower edge of the chassis as shown.




**PICTORIAL 4-2**

Refer to Pictorial 4-2 for the following steps.

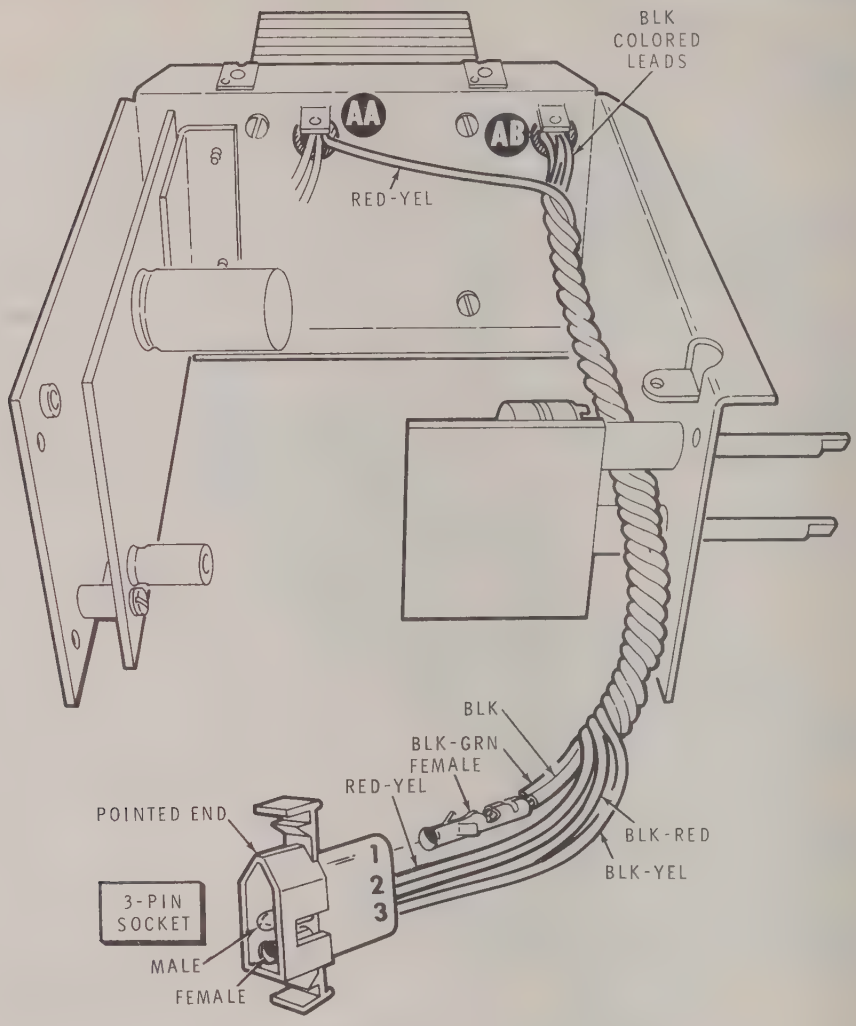
( ) Mount four 3/4" spacers on the power transformer studs, as shown, with #6 lockwashers. Be sure to turn the spacers down snugly.

( ) Position the two red and the red-yellow transformer leads behind the other (black-colored) transformer leads, and inside the corner spacer, as shown in the inset drawing.

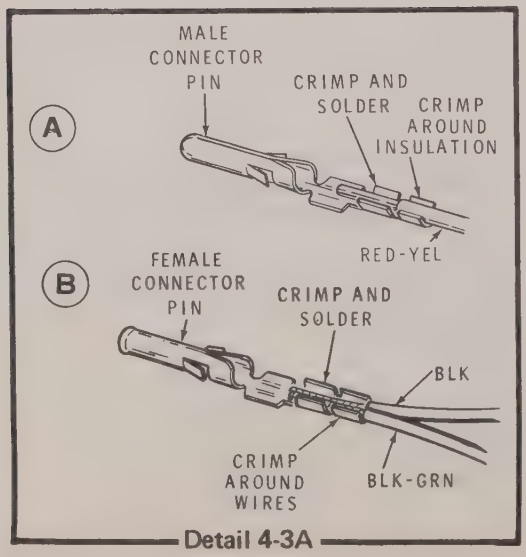
( ) Pass the two red and the red-yellow transformer leads through chassis grommet AA. Pass the black-colored leads through chassis grommet AB.

( ) Alternately pull on the transformer leads coming through grommets AA and AB until the transformer spacers are close to the side panel of the chassis.

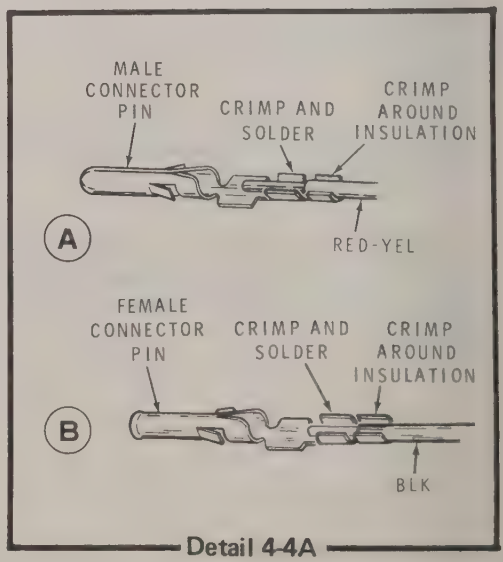
( ) Secure the transformer spacers to the chassis with four #6 lockwashers and four 6-32 x 1/4" screws. Tighten the screws securely.




**PICTORIAL 4-3**




**Detail 4-3A**




**Detail 4-4A**

## Power Transformer Wiring

IMPORTANT NOTE: If the power-line voltage in your area is 110-130 volts AC, refer to the boxed steps which follow, titled "120 VAC Wiring." If the power-line voltage in your area is 220-260 volts AC, disregard the "120 VAC Wiring" instructions and refer to the boxed steps titled "240 VAC Wiring."

### 120—VAC Wiring

Refer to Pictorial 4-3 for the following steps.

( ) Tightly twist together the following transformer leads: red-yellow from grommet AA and the four black-colored leads from grommet AB. NOTE: Do not twist either of the red leads coming from grommet AA into the bundle listed above.

( ) Refer to Part A of Detail 4-3A and crimp a male connector pin (#432-861) onto the end of the red-yellow transformer lead. Solder the lead to the pin as shown.

( ) Tightly twist the ends of the black and the black-green transformer leads together. In the same manner, twist the ends of the black-red and the black-yellow leads together.

( ) Refer to Part B of Detail 4-3A and crimp a female connector pin (#432-873) onto the twisted ends of the black and black-green transformer leads as shown. Solder the leads to the pin.

( ) In the same manner, crimp and solder a female pin onto the twisted ends of the black-red and the black-yellow transformer leads.

NOTE: In the following steps, be sure to properly identify the rear of the 3-pin socket as shown in the Pictorial before you install the connector pins.

( ) Push the connector pin with the black and black-green transformer leads into socket hole 1 until you hear a faint latching "click." NOTE: Hole 1 is the one closest to the pointed end on the front of the socket.

( ) Push the connector pin with the red-yellow lead into socket hole 2.

( ) Push the remaining prepared socket pin with the black-red and black-yellow leads into connector hole 3.

( ) Tug on each of the wires to the connector pins installed in the preceding steps to make sure they are firmly latched.

### 240—VAC Wiring

Refer to Pictorial 4-4 (in the "Illustration Booklet") for the following steps.

( ) Tightly twist together the following transformer leads: red-yellow from grommet AA and the four black-colored leads from grommet AB. NOTE: Do not twist either of the red leads coming from grommet AA into the bundle listed above.

( ) Refer to Part A of Detail 4-4A and crimp a male connector pin (#432-861) onto the end of the red-yellow transformer lead. Solder the lead to the pin as shown.

( ) Refer to Part B of Detail 4-4A and crimp and solder a female connector pin (#432-873) onto the end of the black transformer lead as shown.

( ) In the same manner, crimp and solder a female pin onto the end of the black-red transformer lead.

( ) Tightly twist the bare ends of the black-green and the black-yellow transformer leads together. Twist a wire nut securely onto the ends of these wires as shown in the Pictorial.

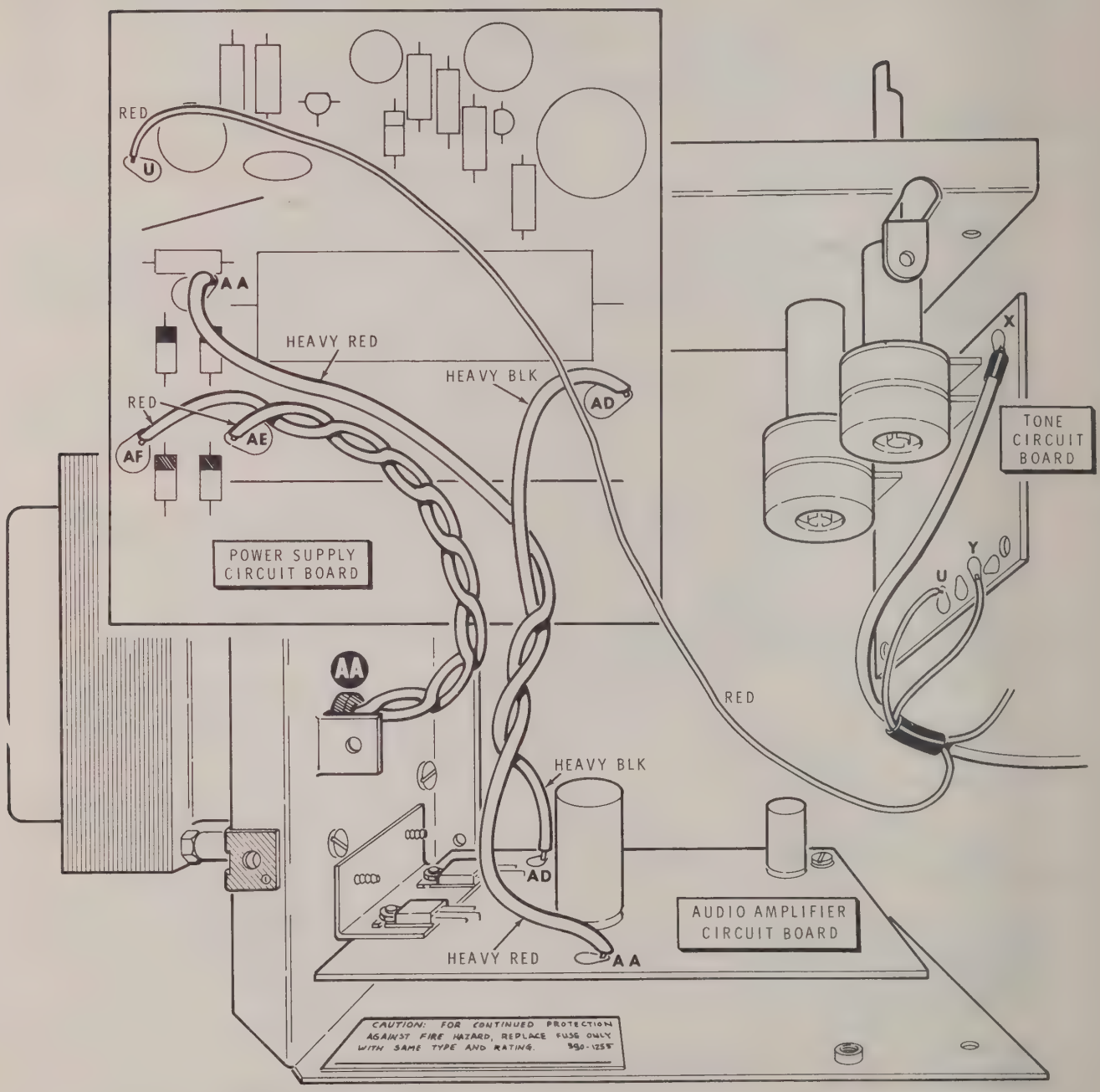
NOTE: In the following steps, be sure to properly identify the rear of the 3-pin socket as shown in the Pictorial before you install the connector pins.

( ) Push the connector pin with the black transformer lead into socket hole 1 until you hear a faint latching "click." NOTE: Hole 1 is the one closest to the pointed end on the front of the socket.

( ) Push the connector pin with the red-yellow lead into socket hole 2.

( ) Push the connector pin on the black-red transformer lead into socket hole 3.

( ) Be sure all three of the connector pins are firmly seated in the socket by pulling on each of them with pliers.




**PICTORIAL 4-5**

( ) Position the 3-pin socket and transformer leads between the two tone control shafts as shown in Pictorial 4-3 (on Page 42) or 4-4 (in the "Illustration Booklet".)

Refer to Pictorial 4-5 for the following steps.

( ) Position the power supply circuit board as shown.

NOTE: As you connect each wire or lead to the power supply circuit board in the following steps, solder it to the foil and cut off the excess length.

( ) Twist together the two red transformer leads coming from grommet AA.

( ) Connect either of the red leads to power supply circuit board hole AE and connect the remaining red lead to AF.

( ) Locate the heavy red and black wires coming from the audio amplifier circuit board. Connect the heavy red wire to power supply circuit board hole AA and the heavy black wire to hole AD.

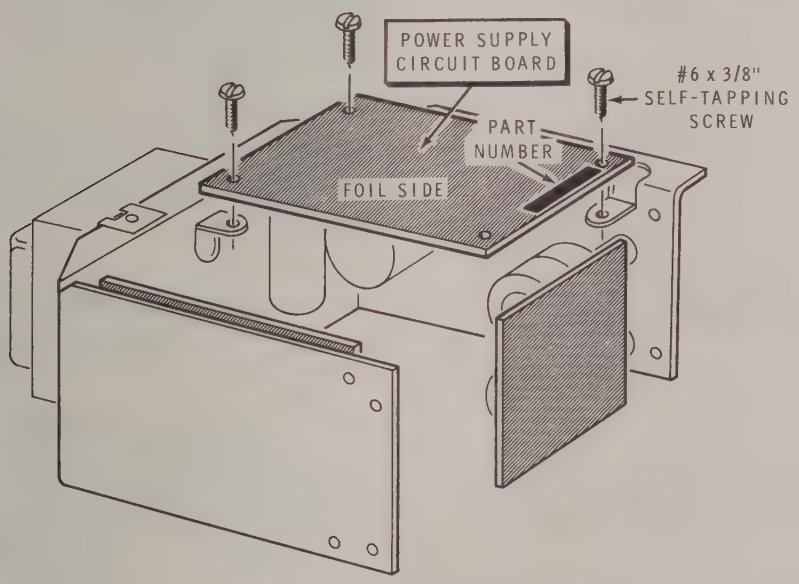
( ) Locate the small red stranded wire coming from tone circuit board hole U. Connect the free end of this wire to power supply circuit board hole U.

Refer to Pictorial 4-6 for the following steps.

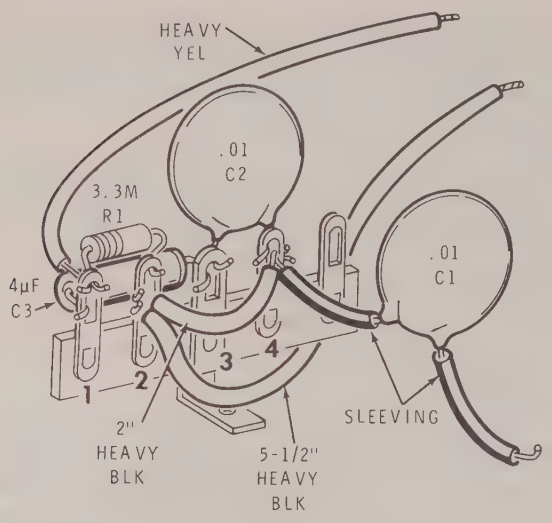
( ) Push the transformer leads down into the center of the chassis.

( ) Position the power supply circuit board with the printed part number on the circuit board foil to your right as shown. Secure the circuit board to the three chassis tabs as shown with #6 x 3/8" self-tapping screws.

Set the left-half chassis assembly aside temporarily.




**PICTORIAL 4-6**




Detail 5-1A

## RIGHT-HALF CHASSIS

Refer to Pictorial 5-1 (in the "Illustration Booklet") and to Detail 5-1A for the following steps.

NOTE: As you prewire the 5-lug terminal strip in the following steps, wrap each component lead and wire securely around each of the terminal strip lugs to assure a good mechanical connection. Solder each connection only when you are instructed to do so. For example, "(S-2)" means to solder a connection, and there will be two wires or leads at that point. "(NS)" means do not solder a connection, more wires or leads will be added later.

( ) Cut both leads of a 4 μF nonpolarized (N.P.) electrolytic capacitor to 3/4".

( ) C3. Position the 5-lug terminal strip as shown in Detail 5-1A. Then connect the prepared 4 μF capacitor between terminal strip lugs 1 (NS) and 3 (NS).

( ) R2. Cut both leads of a 3.3 MΩ (orange-orange-green) resistor to 1/2". Mount this resistor between terminal strip lugs 1 (NS) and 2 (NS).

( ) Prepare a 6" heavy yellow pretinned wire.

( ) Connect one end of the yellow wire to terminal strip lug 1 (S-3). Position the wire as shown in the Detail.

( ) Cut both leads of a large .01 μF disc capacitor to 1/2".

( ) C2. Connect the leads of the prepared .01 μF disc capacitor between terminal strip lugs 3 (S-2) and 4 (NS).

( ) Prepare a 2" length of heavy black pretinned wire.

( ) Connect the 2" black wire between terminal strip lugs 2 (NS) and 4 (NS).

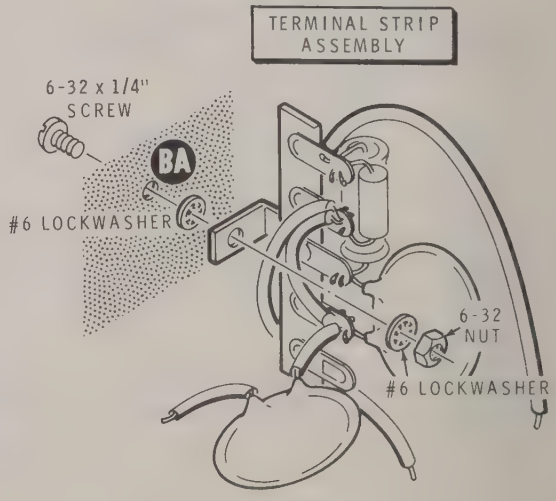
( ) Cut both leads of a large .01 μF disc capacitor to 3/4".

( ) Cut two 1/2" lengths of small fiber sleeving. Place a piece of sleeving on each lead of the prepared .01 μF disc capacitor. Then form a loop in the ends of the capacitor leads to keep the sleeving from falling off.

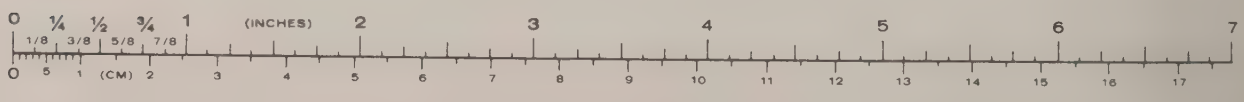
( ) C1. Connect one lead of the prepared .01 μF disc capacitor to terminal strip lug 4 (S-3). Position the capacitor as shown; the free lead will be connected later.

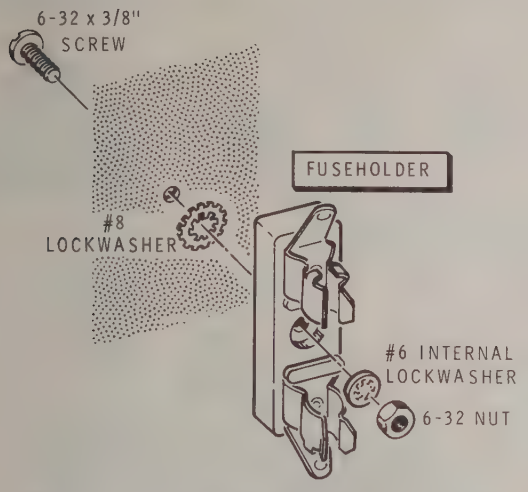
( ) Prepare a 5-1/2" heavy black pretinned wire. Connect one end of this wire to terminal strip lug 2 (NS). The free end will be connected later. Position the wire as shown in Detail 5-1A.

( ) Refer to Detail 5-1B and mount the terminal strip assembly on the chassis at BA with 6-32 x 1/4" hardware. Position the terminal strip as shown in the Pictorial.




Detail 5-1B






**Detail 5-1C**

( ) Refer to Detail 5-1C and mount the fuseholder at F1 as shown. Use a 6-32 x 3/8" screw, a #8 lockwasher under the fuseholder, #6 lockwasher, and a 6-32 nut. Position the fuseholder as shown in the Pictorial.

Refer to Detail 5-1D (in the "Illustration Booklet") for the following five steps.

( ) R1: Mount the 25 kΩ slide control onto the control bracket as shown. Use the screws supplied with the control. Be sure to position lugs 1 and 3 as shown in the Detail.

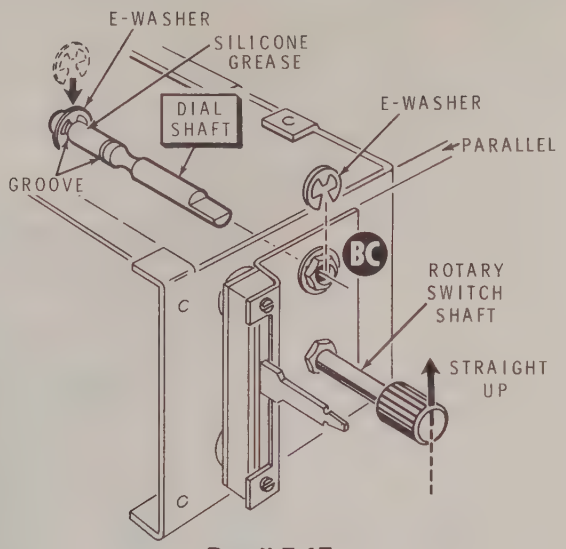
( ) Work the head (hex surface) of the shaft bushing across a piece of fine sandpaper or a smooth file to remove any burring from the surface edges.

( ) Position the control bracket assembly onto the front of the chassis. Place a control lockwasher on the shaft bushing and push the bushing through the bracket and panel at BC. Loosely secure the bushing with a control flat washer and a control nut.

( ) SW1. Place a control lockwasher onto the shaft of the rotary switch. Push the shaft of the rotary control through the chassis front panel and bracket from the inside of the panel. Loosely secure the switch shaft with a control nut.

( ) Push a round knob with pointer onto the shaft of the rotary switch.

( ) Tighten the control nut on the rear of the shaft bushing.




**Detail 5-1E**

Refer to Detail 5-1E for the following six steps.

( ) Position the chassis as shown.

NOTE: If there is a slight burr on the edges of the E-washer, position the burred sides toward the outer ends of the dial shaft.

( ) Push an E-washer into the groove on the rear of the dial shaft as shown.

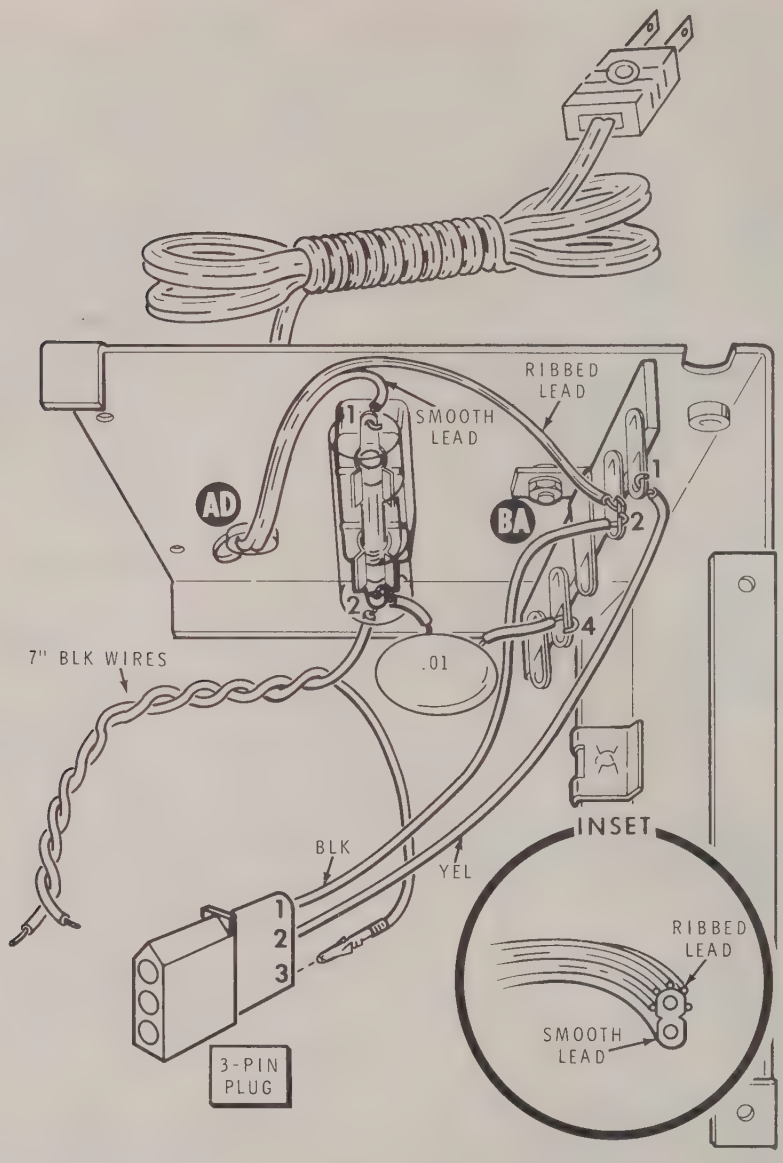
( ) Place a small amount of silicone grease on the dial shaft between the E-washer grooves.

( ) From the inside of the chassis, push the dial shaft forward through shaft bushing BC. Then push another E-washer into the groove at the front of the bushing as shown.

( ) On the inside of the chassis front panel, grasp the body of the rotary switch. Turn the switch knob fully counterclockwise, and then turn the knob one click clockwise.

( ) Turn the body of the switch (on the inside of the panel) until the pointer of the knob is straight up as shown in the Detail. Tighten the control nut on the switch shaft. Recheck the knob pointer to be sure it has not shifted. Also check to be sure the top of the control bracket is parallel with the top edge of the chassis.

( ) Refer to the inset drawing on Pictorial 5-1 (in the "Illustration Booklet") and push spring nuts onto the chassis flange at BH and BJ as shown.




**PICTORIAL 5-2**

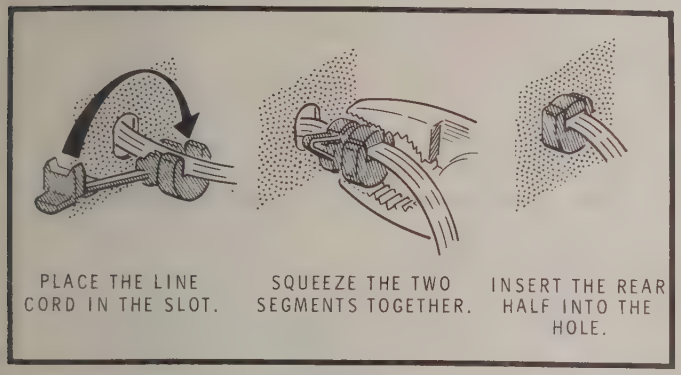
Refer to Pictorial 5-2 for the following steps.

( ) Refer to the inset drawing on the Pictorial to identify the ribbed and smooth sides of the line cord. Separate the end of the line cord 2". Then cut 1" from the end of the smooth line cord lead.

( ) Remove 3/8" of insulation from the end of the line cord wires. Tightly twist the bare end of each of the wires and add a small amount of solder to hold the strands together.

( ) Pass the end of the line cord through hole AD in the rear panel.

( ) Connect the shorter (smooth) line cord wire to fuseholder lug 1 (S-1). Connect the ribbed line cord wire to terminal strip BA lug 2 (S-4). NOTE: Make good mechanical connections on the fuseholder and terminal strip.




**Detail 5-2A**

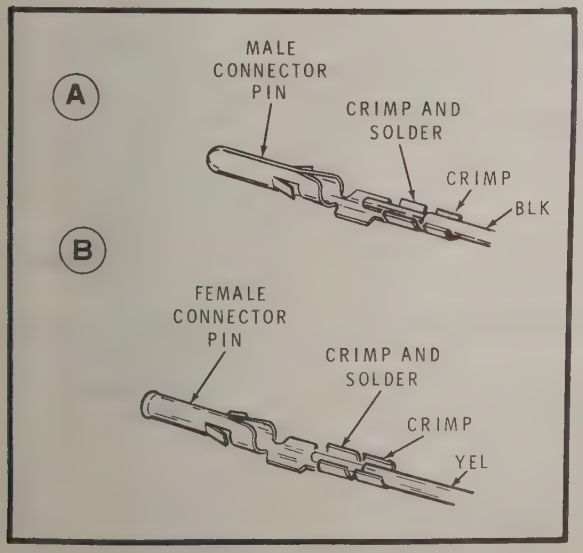
( ) Refer to Detail 5-2A and install a strain relief on the line cord close to the outside of the rear panel as shown. Push the strain relief into the rear panel.

( ) Prepare two 7" heavy black pretinned wires. Twist these two wires together.

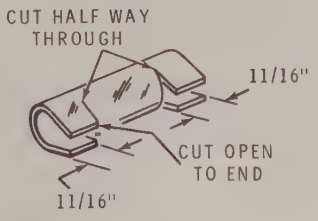
( ) Connect the end of one of these wires to fuseholder lug 2 (NS). The free end will be connected later.

( ) Connect the free lead of the .01 μF capacitor coming from terminal strip BA lug 4 to fuseholder lug 2 (S-2).

( ) Refer to Detail 5-2B, Part A. Crimp and solder a male connector pin onto the end of the other black wire of the twisted pair. Push the pin on this wire into 3-pin plug hole 3. NOTE: Be sure to push the pin into the rear side of the plug as shown.




**Detail 5-2B**



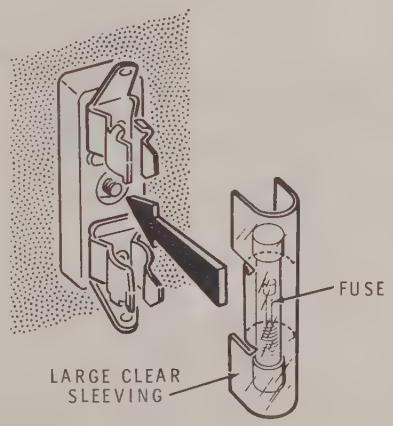

**Detail 5-2C**

( ) Locate the black wire coming from terminal strip BA lug 2. Crimp and solder a male pin onto the end of this wire. Push the pin into 3-pin plug hole 1.

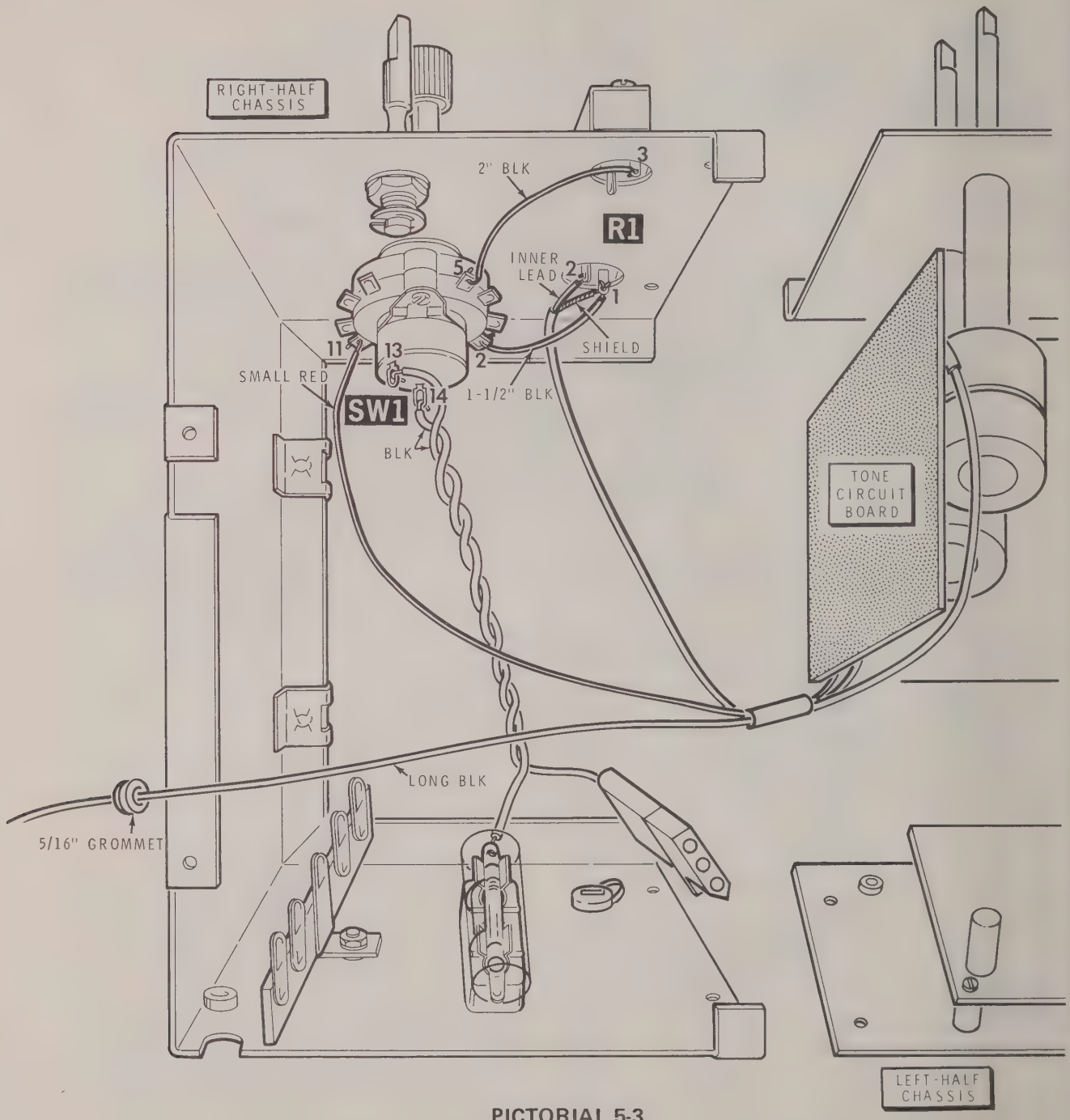
( ) Refer to Detail 5-2B, Part B. Crimp and solder a female pin onto the end of the yellow wire coming from terminal strip BA lug 1. Push the pin on this wire into hole 2 of the 3-pin plug.

( ) Cut a 2" length of large clear sleeving. Then refer to Detail 5-2C and prepare the sleeving as shown.

( ) Locate the 3/16-ampere slow-blow fuse. Position the fuse into the large sleeve and install it in the fuseholder as shown in Detail 5-2D.




**Detail 5-2D**




**PICTORIAL 5-3**

Refer to Pictorial 5-3 for the following steps.

( ) Position the right-half chassis as shown.

NOTE: When you install the wires in the following step, be sure to firmly wrap each wire end around its switch lug to assure a good mechanical connection. See Detail 5-3A for lug numbers.

( ) At the free end of the twisted pair of heavy black wires, connect either wire to switch SW1 lug 13 (S-1) and connect the other wire to lug 14 (S-1).

( ) Prepare a 1-1/2" length and a 2" length of small black stranded wire.

( ) Connect a 1-1/2" black wire from slide control R1 lug 1 (NS) to rotary switch SW1 lug 2 (NS).

( ) Connect a 2" black wire from rotary switch SW1 lug 5 (S-1) to slide control lug 3 (S-1).

The remaining two wires and the shielded cable coming from the tone circuit board will be connected in the following steps.

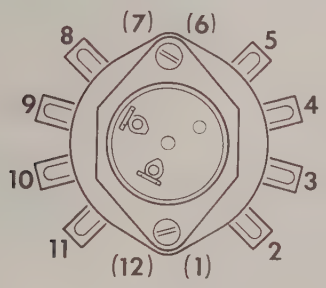
( ) Position both chassis halves close to each other as shown in the Pictorial.

( ) Connect the small red wire coming from the tone circuit board to switch SW1 lug 11 (S-1).

( ) At the free end of the shielded cable, connect the inner lead to slide control R1 lug 2 (S-1), and connect the shield lead to lug 1 (S-2).

( ) Pass a 5/16" rubber grommet onto the long black wire coming from the tone circuit board.

( ) Carefully check to be sure none of the connections at slide control R1 are touching the chassis.

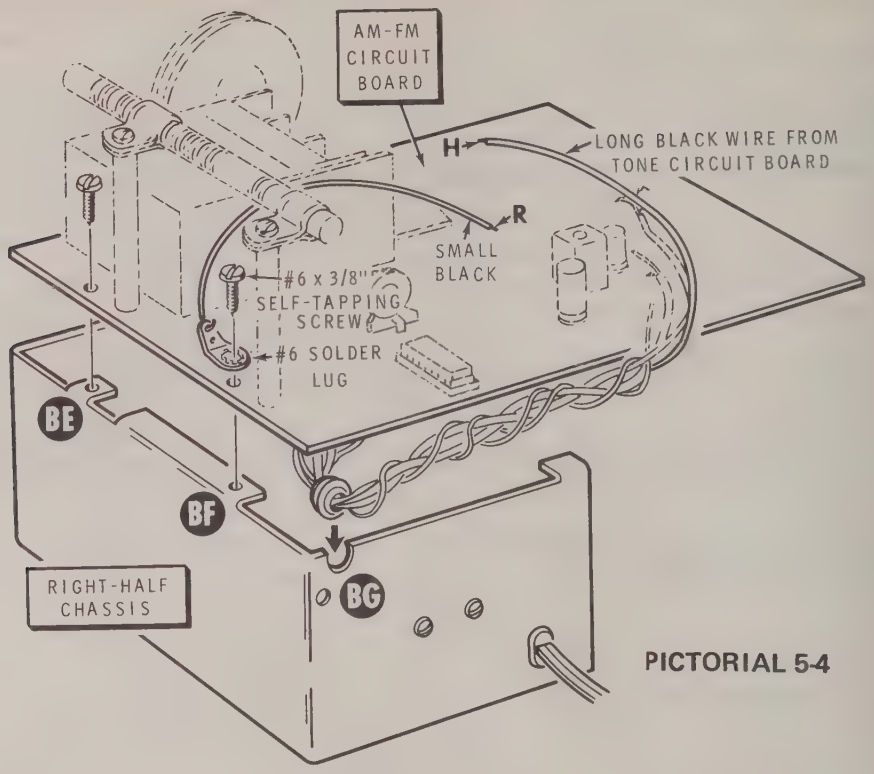



**SW1**

**(REAR VIEW)**

(NOTE: LUG POSITIONS ARE CALLED OUT, EVEN WHEN A LUG IS MISSING.)

**Detail 5-3A**




**PICTORIAL 5-4**

Refer to Pictorial 5-4 for the following steps.

( ) Position the right-half chassis as shown in the Pictorial.

( ) Position the AM-FM circuit board over the top of the right-half chassis. Locate the long black wire coming from the tone circuit board; this wire has a grommet on it.

( ) At the rear of the AM-FM circuit board, twist the two shielded cables and the red and white-red wires together as shown. Route the cables and wires to the right along the rear edge of the circuit board.

( ) Pass the free ends of these wires and cables through the 5/16" grommet that already has the black wire through it. NOTE: These wires and cables will run in a direction opposite to the direction of the black wire. Pull the cables and wires through the grommet until you can position the grommet into rear chassis panel slot BG.

( ) Position all the wires and cables that are going through the grommet in under the AM-FM circuit board, to the inside of the chassis.

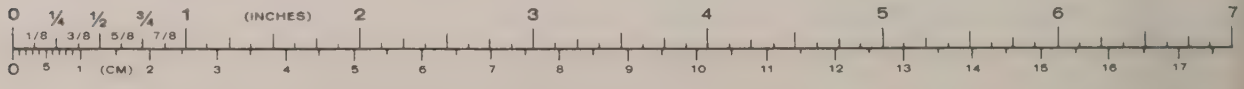
( ) Position the cable grommet down into chassis slot BG.

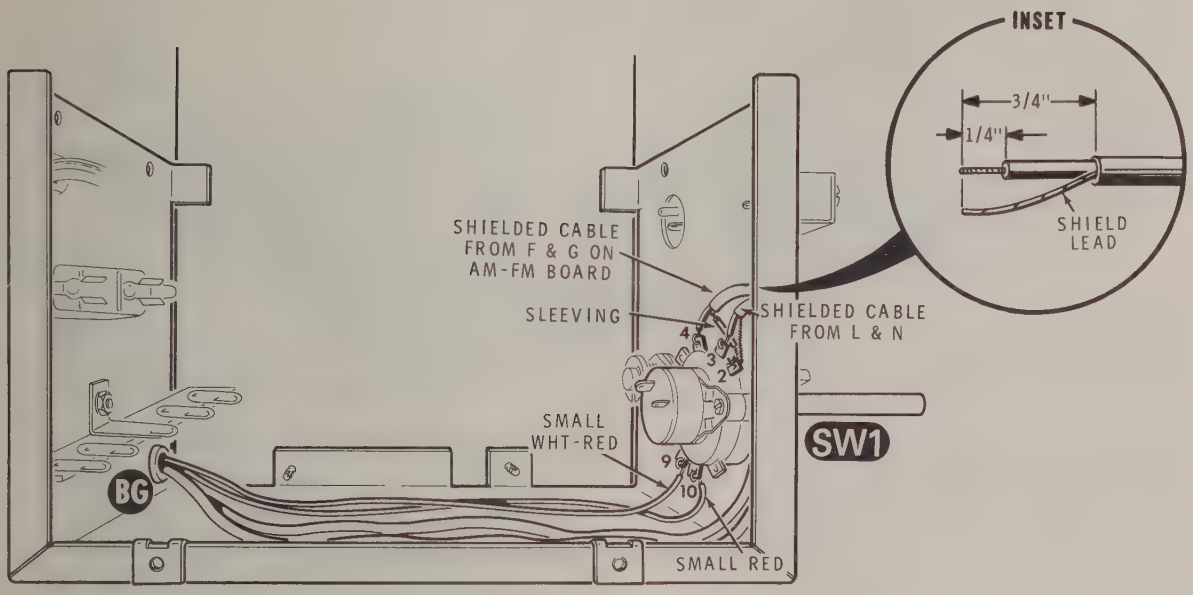
( ) Secure the AM-FM circuit board to the right-half chassis with #6 x 3/8" self-tapping screws at BE and BF as shown. Use a #6 solder lug under screw BF and position it as shown in the Pictorial.

( ) Wrap the long black wire coming through grommet BG around the other wires and cables along the rear edge of the chassis. Connect the free end of this wire to hole H near the front edge of the board as shown. Solder the wire to the foil and cut off the excess wire length.

( ) On the underside of the AM-FM circuit board, carefully pull all the wires coming through grommet BG until they are snug against the top rear edge of the board.

( ) Connect the free end of the small black wire coming from R in the AM-FM circuit board to solder lug BF (S-1).






**PICTORIAL 5-5**

Refer to Pictorial 5-5 for the following steps.

Connect the wires and cables coming from grommet BG in the following steps.

( ) Turn the right-half chassis bottom-side up as shown in the Pictorial.

( ) Connect the free end of the white-red wire coming from BG to SW1 lug 9 (S-1).

( ) Connect the free end of the small red wire coming from grommet BG to rotary switch SW1 lug 10 (S-1).

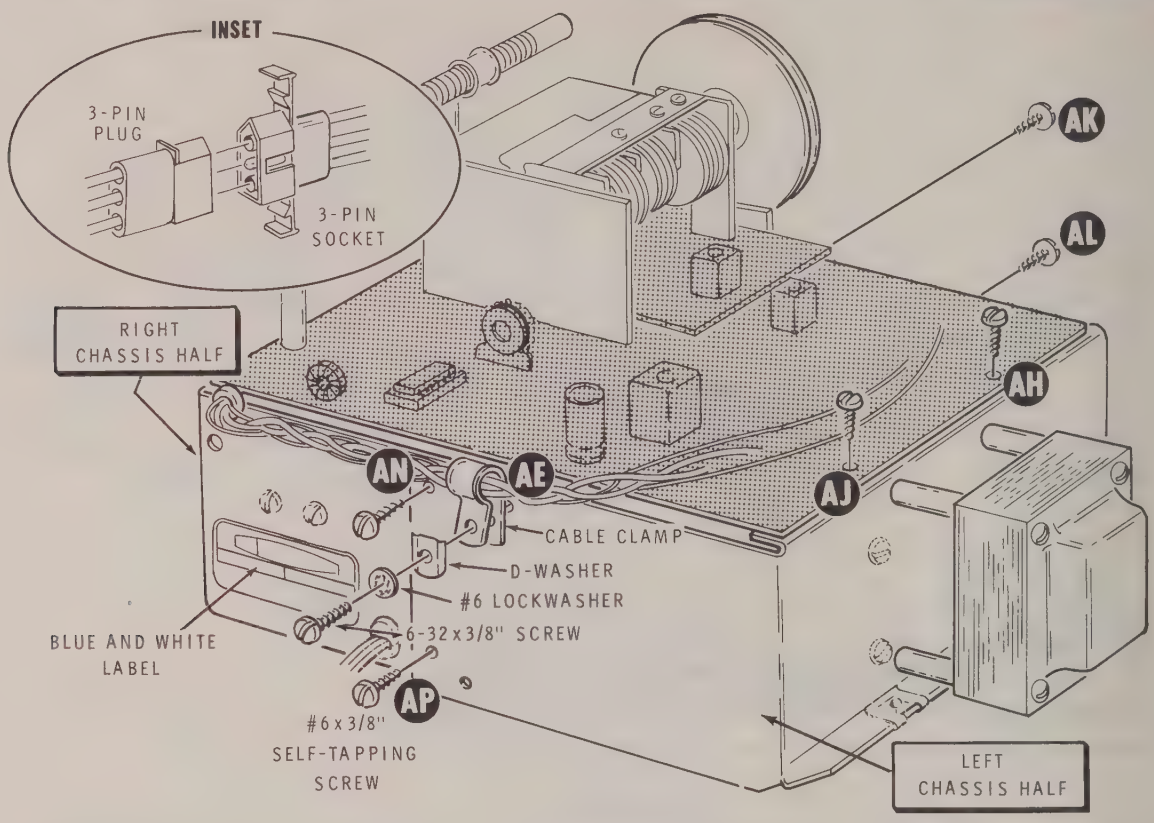
( ) Connect the leads of the prepared shielded cable coming from grommet BG as follows: inner lead to SW1 lug 3 (S-1) and the shield lead to SW1 lug 2 (NS).

( ) Refer to the inset drawing on Pictorial 5-5 and prepare the remaining shielded cable end coming from grommet BG as shown.

( ) Connect the ends of this cable as follows:

1. Inner lead to SW1 lug 4 (S-1).
2. Cut a 3/8" length of small sleeving.
3. Place the sleeving on the shield lead of the cable. Then connect the shield lead to SW1 lug 2 (S-3).

( ) Position the wires coming from grommet BG as shown in the Pictorial.




**PICTORIAL 5-6**

Refer to Pictorial 5-6 for the following steps.

( ) On the underside of the chassis halves, push the two halves of the 3-pin connectors together. Be sure they are fully connected.

NOTE: As you connect the chassis halves in the following steps, first start all six of the mounting screws in their indicated holes. After all six are started, go over them again and turn them down until they are tight.

( ) Push the two chassis halves together as shown in the Pictorial. Be sure the left-half chassis is outside the right-half chassis and that the left edge of the AM-FM circuit board is on the top of the chassis. Be sure no wires are pinched between the chassis halves.

( ) Secure the chassis halves together at AN and AP on the rear panel and at AK and AL on the front panel. Use #6 x 3/8" self-tapping screws.

( ) Inspect the shaft of the 25 kΩ slide control to see if it is parallel to the other four shafts. If necessary, adjust the control bracket by bending it slightly until the shaft of this control is exactly parallel to the others.

( ) Secure the left edge of the AM-FM circuit board to the chassis at AH and AJ with #6 x 3/8" self-tapping screws.

( ) Temporarily remove the 6-32 x 3/8" screw and lockwasher from the rear of the chassis at AE.

( ) Place a cable clamp around the five wires and cables along the rear of the AM-FM circuit board as shown. Secure the cable clamp through the chassis at AE and to the spacer on the audio amplifier with a D-washer and the 6-32 x 3/8" screw and #6 lockwasher previously removed.

( ) Remove the paper backing from the blue and white label and press the label in place on the rear of the chassis. NOTE: Always refer to the Model and Series Number on this label in any correspondence you have with Heath Company about this kit.

## DIAL ASSEMBLY

Refer to Pictorial 5-7 (in the "Illustration Booklet") for the following steps.

( ) Turn the dial pulley fully clockwise until the tuning capacitor plates are fully opened.

NOTE: In the following step, you will be instructed to string the dial pulley and dial shaft. Carefully read the step all the way through as you study the Detail. Be sure you understand the procedure before you start to string the dial. Also note that the dial pulley opening may be in a position slightly different than that shown in the illustration. However, if you follow the step carefully it will work out correctly.

( ) Refer to Detail 5-7A (in the "Illustration Booklet") and install the dial cord as follows:

1. Connect the dial spring to one of the dial cord tabs.
2. Connect the tab on the end of the dial cord without the spring to tab A on the dial pulley.
3. Pass the dial cord part way, clockwise around the dial pulley; then over to the dial shaft.
4. Pass the dial cord <u>three full turns</u> clockwise around the dial shaft.
5. Route the dial cord to the underside of the dial pulley, and then one full turn around the pulley.
6. Pass the free end of the cord through the pulley opening.
7. Hook the other end of the spring around tab B on the pulley as shown.

( ) Push a round knob without a pointer onto the end of the dial shaft. Rotate the shaft in both directions to be sure the dial pulley rotates a full 180 degrees (half circle).

( ) Push round pointer knobs onto the shafts at R402, R405, and SW1 as shown in the Pictorial.

( ) Push the slide control knob onto the flat shaft of control R1.

( ) Turn the dial shaft counterclockwise so the capacitor plates are fully meshed.

( ) Remove the paper backing from the dial calibration label (#390-1207). Study the Pictorial; then carefully position the calibration label over the dial pulley shaft adapter in the manner shown. Be sure the straight line across the center of the label is straight up and down, and that the calibration scale is toward the right. Press the calibration label onto the rim of the pulley.

( ) Refer to Detail 5-7B, Part A, and remove the top screw from slide control R1. Position the long #8 solder lug at the top of the slide control and secure the lug with the screw removed in this step. Position the solder lug straight up as shown.

( ) Refer to Detail 5-7B, Part B. Twist the flat side of the #8 solder lug 90 degrees, so the narrow edge of the lug faces the dial calibration label. This lug will now be referred to as the "calibration pointer."

( ) Use long-nose pliers to carefully align the calibration pointer with the straight line across the calibration dial. You may have to bend the pointer slightly to do this.

( ) Turn the dial fully clockwise so the opposite end of the straight line is under the calibration pointer. If it is not, bend the pointer slightly toward the straight dial line. Check both ends of the dial once again. Adjust the pointer slightly, as necessary, until the pointer aligns with both ends of the calibration dial straight line. Adjust the calibration label slightly if necessary.

( ) Firmly press the outer edges of the calibration label onto the rim of the dial pulley. NOTE: This label will <u>not</u> be removed from the pulley.

This completes the step-by-step assembly of the chassis. Inspect it carefully at this time to be sure there are no loose or unsoldered connections, or bits of wire or solder splashes lodged in the wiring. Then proceed to the "Cabinet Assembly."

# CABINET ASSEMBLY

Refer to Pictorial 6-1 for the following steps.

( ) Remove the two phillips screws from the cabinet rear panel. Remove the padding and the two phillips screws (in a small envelope) from inside the cabinet. Set the screws and the rear panel aside temporarily.

NOTES: 1. As you mount the speaker in the following steps, use care to avoid damage to the paper speaker cone.

2. Remove your watch; it could be damaged by the speaker magnet.

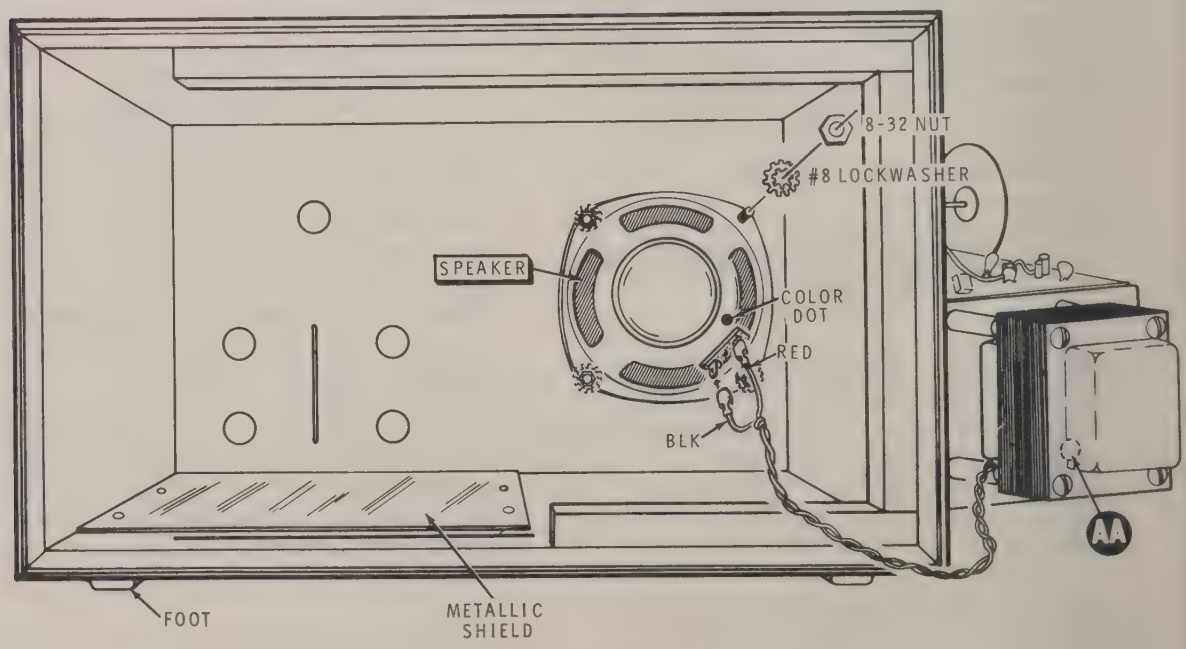
( ) Position the speaker onto the studs on the inside of the cabinet front panel. Position the speaker lugs as shown; then secure the speaker to the cabinet with four #8 lockwashers and four 8-32 nuts. NOTE: Do not overtighten the speaker nuts, as the speaker could be damaged.

( ) Remove the paper backing from the metallic shield. Press the shield in place in the bottom of the cabinet as shown in the Pictorial. Be sure all four shield holes line up with the holes in the cabinet bottom.

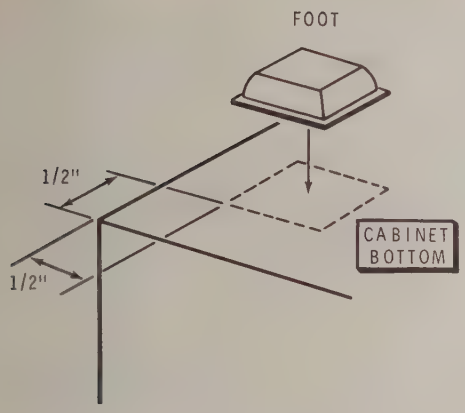
( ) Turn the cabinet bottom-side up.

( ) Remove the paper backing from each of the four feet and press a foot firmly in place at each corner on the bottom of the cabinet, as shown in Detail 6-1A.

( ) Turn the cabinet right side up.




**PICTORIAL 6-1**

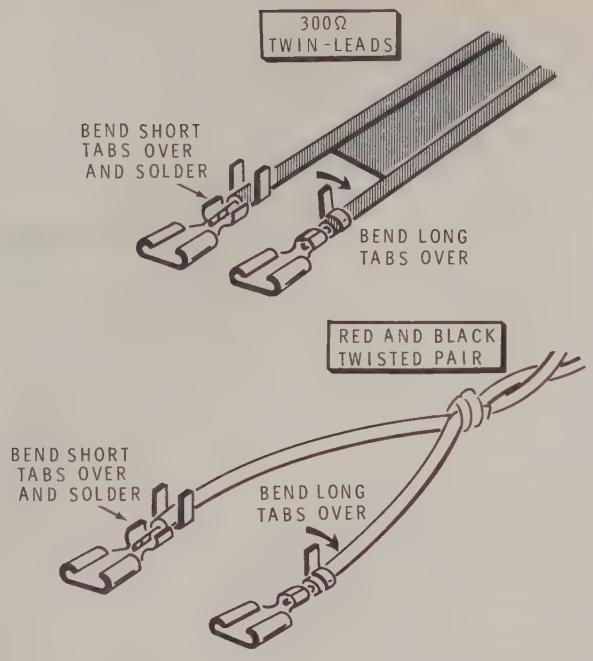



**Detail 6-1A**

( ) Position the chassis assembly near the cabinet.

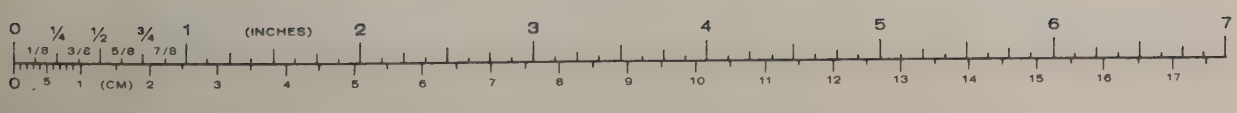
( ) Refer to Detail 6-1B and crimp and solder a push-on connector onto the end of either 300 Ω twin-lead as shown.

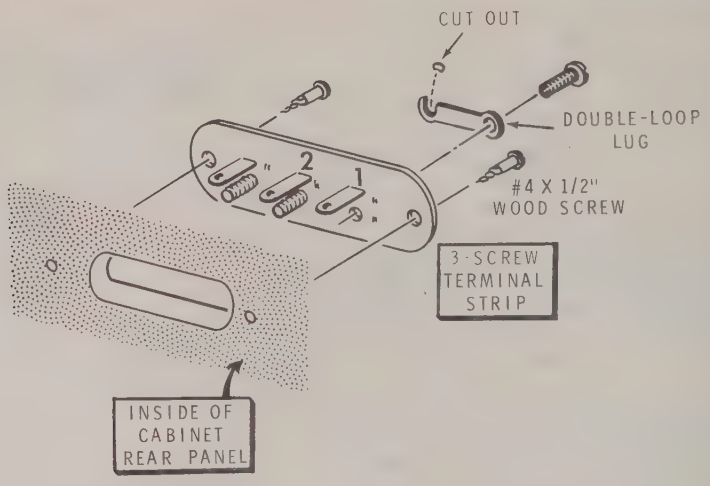
( ) In the same manner, crimp and solder push-on connectors onto the other twin-lead and the red and black wires coming from chassis grommet AA (beneath the transformer).


300Ω TWIN-LEADS
BEND SHORT TABS OVER AND SOLDER
BEND LONG TABS OVER
RED AND BLACK TWISTED PAIR
BEND SHORT TABS OVER AND SOLDER
BEND LONG TABS OVER

**Detail 6-1B**

( ) Position the chassis assembly close to the back side of the cabinet as shown in the Pictorial. Push the connector on the small red wire onto the marked speaker terminal and push the small black wire connector onto the unmarked speaker terminal.






**Detail 6-2A**

Refer to Pictorial 6-2 (in the "Illustration Booklet") for the following steps.

NOTE: The cabinet rear panel has a small rectangular cutout in its bottom edge. Use this small cutout as a reference to properly position the rear panel in the following steps.

Refer to Detail 6-2A for the next four steps.

( ) Position the 3-screw terminal strip onto the rear panel as shown. On the inside of the panel, make sure the terminal lugs are up. Secure the terminal strip with two #4 × 1/2" wood screws.

( ) Cut a segment out of one side of the double-loop lug as shown.

( ) Remove the screw from terminal strip lug 1. Then place the double-loop lug on it, as shown, and turn the screw back into the terminal strip.

( ) Loosen the screw at terminal strip lug 2. Position the cut end of the double-loop lug under this screw. Tighten the screws at lugs 1 and 2.

( ) Prepare a 36" length of white-red wire by removing 1/4" of insulation from one end of the wire. Add solder to the bare wire end.

( ) Connect the bare end of the white-red wire to terminal strip lug 1 as shown (S-1).

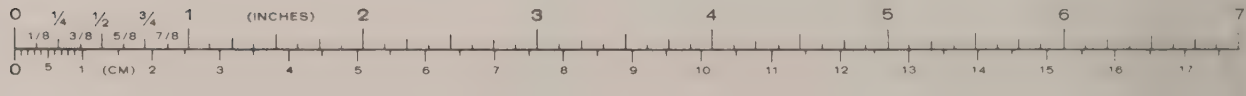
( ) Push four thumbtacks part way into the inside of the rear panel at CA, CB, CC, and CD as shown.

( ) Route the white-red wire coming from the 3-screw terminal strip around thumbtacks CA, CB, CC, and CD as shown. As you pass the wire around each thumbtack, firmly press the tack into the panel.

( ) Form a small loop in the free end of the wire and place a thumbtack inside the loop. Pull on the end of the wire until it is snug; then firmly push the tack in place on the rear panel at CE.

( ) Position the rear panel close to the chassis assembly. Then push the connectors on the lead ends of the 300 twin-lead onto lugs 2 and 3 of the rear panel terminal strip as shown.

Except for the "Final Assembly" of your Radio, this completes the step-by-step assembly of the kit. Do not plug the Radio into an AC outlet until you are instructed to do so.



# TESTS AND ADJUSTMENTS

This portion of the Manual is divided into two sections, "Adjustments Without Instruments," and "Alignment With Instruments." If you have the proper instruments as listed on Page 62, disregard the "Adjustments Without Instruments" section below and perform the "Alignment With Instruments" on Page 62.

NOTES:

1. Do not plug the line cord into an AC receptacle until you are told to do so.
2. If, at any time, you are unable to obtain the desired results as you perform the alignment steps, immediately turn the Radio off, remove the line cord from the AC outlet, and refer to the "In Case of Difficulty" section (Page 68).

Refer to Figure 1-1 to become familiar with the front panel controls.

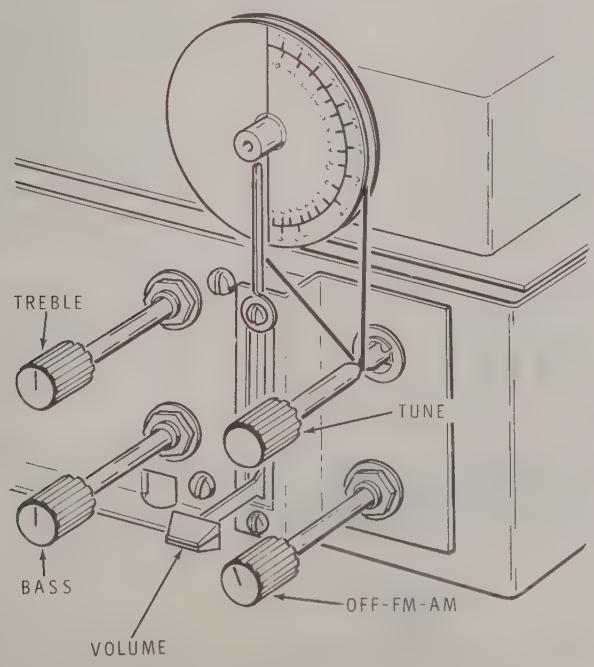



**Figure 1-1**

# ADJUSTMENT WITHOUT INSTRUMENTS

Figure 1-2

( ) Refer to Figure 1-2 and place a tape "flag" on the alignment tool as shown.

Refer to Figure 1-3 for the following steps.

( ) Place a piece of tape over the following components so you will not accidentally make adjustments to them; these items may only be adjusted during the instrument alignment procedures.

RF trimmer C217
IF transformer T203
Detector coil L302

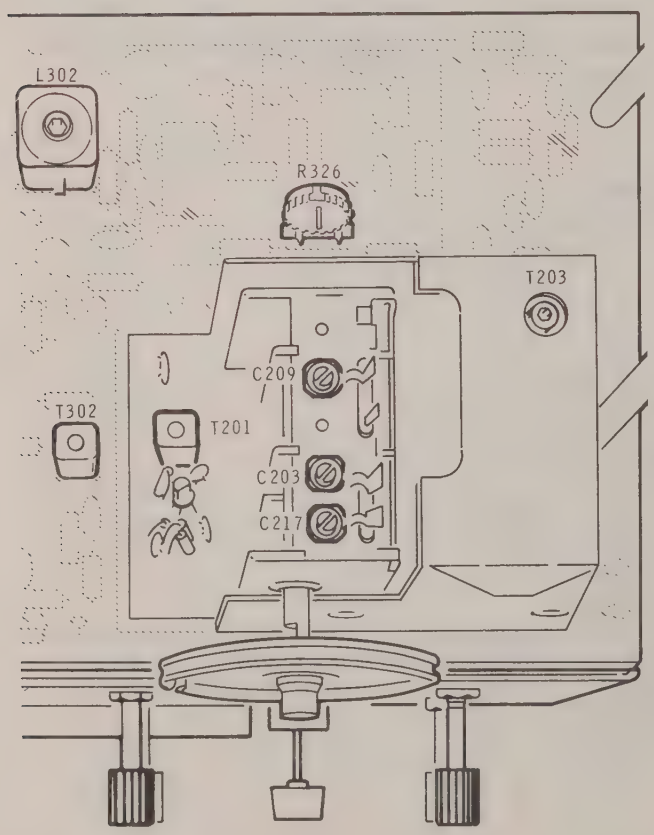



Figure 1-3

## AM ADJUSTMENTS

( ) Preset the controls and switch as follows:

VOLUME control — Approximately 1/4" up from the bottom.
BASS control — Center of rotation.
TREBLE control — Center of rotation.
OFF-FM-AM switch — OFF.

( ) Turn AM oscillator trimmer capacitor C209 clockwise until it is just snug. Then turn it 1/2 turn counterclockwise.

( ) Turn AM RF trimmer capacitor C203 clockwise until it is just snug. Then turn it counterclockwise 1/4 turn.

( ) Set AFC ADJ control R326 to the center of rotation.

( ) Turn the TUNE shaft fully counterclockwise (tuning capacitor plates fully meshed).

( ) Plug the line cord into an AC outlet.

( ) Turn the OFF-FM-AM switch to AM (fully clockwise).

( ) Adjust the VOLUME slide control as necessary until you hear an audible hiss or noise from the speaker. If you hear a radio station, turn the TUNE knob slightly until you can no longer hear it.

Refer to Figure 2-1 (in the "Illustration Booklet") for the following steps.

( ) 1. Refer to the inset drawing in Figure 2-1 and turn the tuner shaft until the pointer is between 5.5 and 6 on the calibration label.

( ) 2. Turn on a source of electrical noise (for example: an electric shaver, a kitchen mixer, or a fluorescent light) and place it near the Radio so you can hear the noise clearly from the speaker. Be sure the dial indicates a frequency somewhere between 5.5 and 6, as shown on the inset drawing on Figure 2-1.

NOTE: As you perform the following adjustment, keep your body, hands, and arms as far from the AM rod antenna as possible to avoid a false indication of noise at the antenna.

( ) 3. Use a small screwdriver to adjust AM oscillator transformer T201 as you listen for maximum noise from the speaker. If necessary, adjust the VOLUME control for quieter operation. Do not turn the transformer slug more than 1/2 turn.

( ) 4. Turn off the noise source; then turn the TUNE knob until you hear a strong, clear station.

( ) 5. Use the alignment tool and adjust IF transformer T302 for the loudest and clearest sound from the broadcast station. Adjust the VOLUME control as necessary.

NOTE: In the following step, it is important that you know the frequency of an AM broadcast station between 1300 and 1600 kHz (13 and 16 on the calibration dial).

( ) 6. Turn the dial knob until you can hear a station whose frequency you know is between 1300 and 1600 kHz. NOTE: This station's frequency may not agree with the setting on the calibration dial at this time.

NOTE: As you adjust the AM oscillator trimmer capacitor in the following step, perform the operation slowly; and, at the same time, very slowly turn the tuning knob in the direction of the correct calibration dial reading.

( ) 7. Slowly adjust trimmer capacitor C209, and turn the dial at the same time in the direction of the correct calibration frequency. When you hear the station at the correct calibration frequency, do not make any further adjustment on the trimmer capacitor.

( ) 8. Use the alignment tool to carefully adjust RF trimmer capacitor C203 until the station is as loud as possible. Again, adjust the VOLUME control as required.

( ) 9. Return to Step 1 and repeat the above steps with the source of noise further from the Radio. Also, tune in weaker stations. This will adjust your Radio for maximum sensitivity. After you complete the steps for the second time, proceed to the "FM Adjustments."

## FM ADJUSTMENTS

( ) Preset the VOLUME control to 1/4" from the bottom.

( ) Turn the OFF-FM-AM control to its center (FM) position.

NOTE: You must know the exact frequency of an FM broadcast station between 96.1 and 104.1 MHz. These frequencies are always listed in odd tenths. For example: 101.7, 102.5, 104.1, and so on.

( ) Turn the TUNE knob until you hear a station whose frequency you know to be between 96.1 and 104.1 MHz. The correct frequency may not be indicated by the calibration dial pointer at this time. NOTE: If necessary, connect an additional length of wire or an FM antenna to the antenna terminal strip on the cabinet back panel.

Refer to Figure 3-1 (in the "Illustration Booklet") for the following steps.

( ) Slowly and carefully adjust AFC ADJ control R326 and, at the same time, slowly turn the TUNE knob toward the correct calibration dial frequency. Be sure to keep the sound of the station at an audible level as you perform this operation. Stop when the calibration dial pointer indicates the correct station frequency.

( ) Slowly rock the TUNE knob back and forth across the calibrated station frequency. Check to see that the station fades from the speaker equally on both sides of the calibration frequency. If not, slightly readjust control R326 until the fading appears to be equal.

( ) Turn the OFF-FM-AM switch Off and remove the line cord from the AC receptacle.

( ) Remove the four round knobs and the slide control knob from their shafts.

This completes the "Adjustments Without Instruments." Proceed to the "Final Assembly" on Page 64.

# ALIGNMENT WITH INSTRUMENTS

It is recommended that only persons familiar with instrument alignment perform the following adjustments. Refer to Figure 4-1 (in the "Illustration Booklet") for the instrument connecting points and the location of the components to be adjusted in the following steps.

Equipment needed:

FM Signal Generator
Audio Voltmeter
Harmonic Distortion Meter
DC Voltmeter
AM Signal Generator with 400 Hz modulation

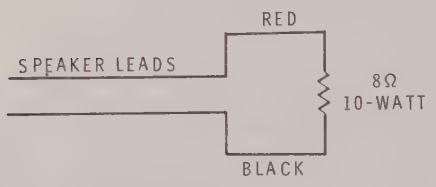



Figure 4-2

## FM ALIGNMENT

( ) Preset AFC ADJ control R326 to the center of its rotation.

( ) Refer to Figure 4-2 and disconnect the red and black wires from the speaker. Then connect an 8-ohm, 10-watt resistor between these leads as shown.

( ) Connect the harmonic distortion meter and the audio voltmeter across the 8-ohm load as shown in Figure 4-3.

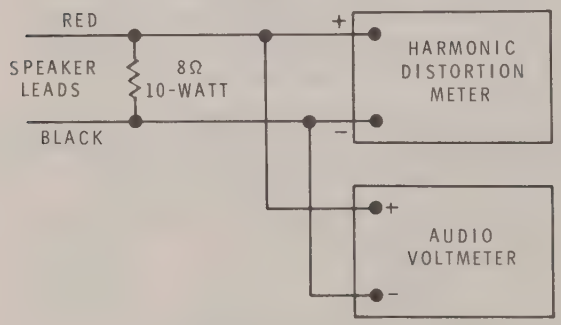



Figure 4-3

( ) Connect the DC voltmeter to the output of the AFC differential amplifier to measure the AFC control voltage. This will be a small positive voltage.

( ) Connect the FM generator to the tuner FM antenna terminals through a 300-ohm resistive matching network as shown in Figure 4-4.

( ) Set the FM generator center frequency to 104 MHz and the modulation selector switch to 400 Hz. Set the modulation control for a deviation of 75 kHz and the output level to 100 $\mu$V.

( ) Set the VOLUME control 1/2" up from the bottom.

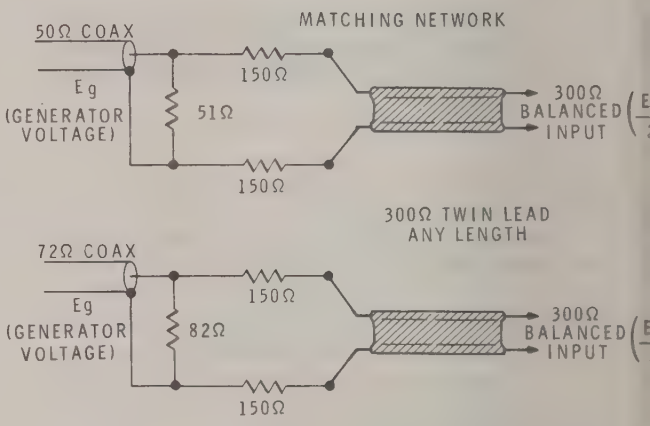



Figure 4-4

( ) Turn the OFF-FM-AM switch to the FM position.

( ) Carefully tune the Radio to the 104 MHz generator signal.

( ) Adjust AFC ADJ control R326 and the TUNE knob to the calibration dial frequency at 104.

NOTE: Perform the following steps two times. The first time, you will tune the IF amplifiers for maximum sensitivity. The second time, you will adjust the Radio for minimum distortion.

1. Set the generator and the Radio to 98 MHz.
2. Adjust the VOLUME control for a 2-volt rms output on the audio voltmeter.
3. Decrease the generator output until there is approximately 3% distortion.
4. Adjust the top and bottom slugs of IF transformer T203 for maximum audio output and minimum distortion.
5. Increase the signal generator output to 1000 $\mu$V.
6. Alternately adjust AFC ADJ control R326 and quadrature detector coil L302 and find a suitable setting of both components that will produce minimum distortion. The AFC output of the Radio at this point should indicate 1-volt DC ±0.15 volt.
7. Repeat steps 1 through 6 at least one more time.

## AM ALIGNMENT

( ) Connect one lead of the audio voltmeter to lug 1 of the VOLUME slide control. Connect the other voltmeter lead to lug 3.

( ) Turn the OFF-FM-AM switch to AM.

( ) Preset the VOLUME control 1/2" up from the bottom.

( ) Proceed with the AM alignment as outlined in the following chart.

## ALIGNMENT CHART

| | STEP | Connect AM Signal Generator to: | Set Frequency of AM Generator Modulated 30% at 400 Hz to: | Set AM Dial Pointer to: | Adjust for Maximum Output on the Audio Voltmeter: |
|---|---|---|---|---|---|
| Adjust the generator output attenuator for approximately 20 dB S+N/N*. | 1. | Loosely coupled to rod antenna (lay hot lead of AM generator close to rod). | 455 kHz. | Extreme low frequency end of dial. | 1. Slug of T302. |
| | 2. | | 600 kHz. | 60 on AM dial. | **1. Slowly turn the dial pointer back and forth (on each side of the generator frequency) while adjusting the slug of coil T201. |
| | 3. | | 1400 kHz. | 140 on AM dial. | 1. C209 – AM OSC.<br>2. C203 – AM RF. |
| | 4. | Repeat steps 2 and 3 until no further improvement is obtained. | | | |

*Signal + Noise / Noise

**NOTE: Maximum meter deflection may be ±20 kHz from the station frequency.

This completes the "Alignment With Instruments;" proceed to the "Final Assembly" on the following pages.

# FINAL ASSEMBLY

Refer to Pictorial 7-1 (in the "Illustration Booklet") for the following steps.

( ) Fold the fiberglass pad double.

( ) Position the fiberglass pad into the cabinet and around the speaker as shown in the inset drawing on Pictorial 7-1.

( ) If necessary, remove all five knobs from the control shafts and dial shaft.

( ) Temporarily disconnect the antenna leads from the cabinet rear panel terminal lugs.

NOTE: Do not remove the calibration label from the dial pulley; it may be required for future reference.

( ) Carefully position the chassis assembly into the cabinet so the five control shafts come through their openings in the front panel. Be sure the lower rear chassis flange is positioned into the slot in the bottom rear of the cabinet.

( ) Secure the chassis to the cabinet from the underside with four 6-32 x 5/8" screws and four #6 flat washers as shown. Tighten the screws securely.

( ) Reconnect the antenna leads to the rear panel terminal strip lugs.

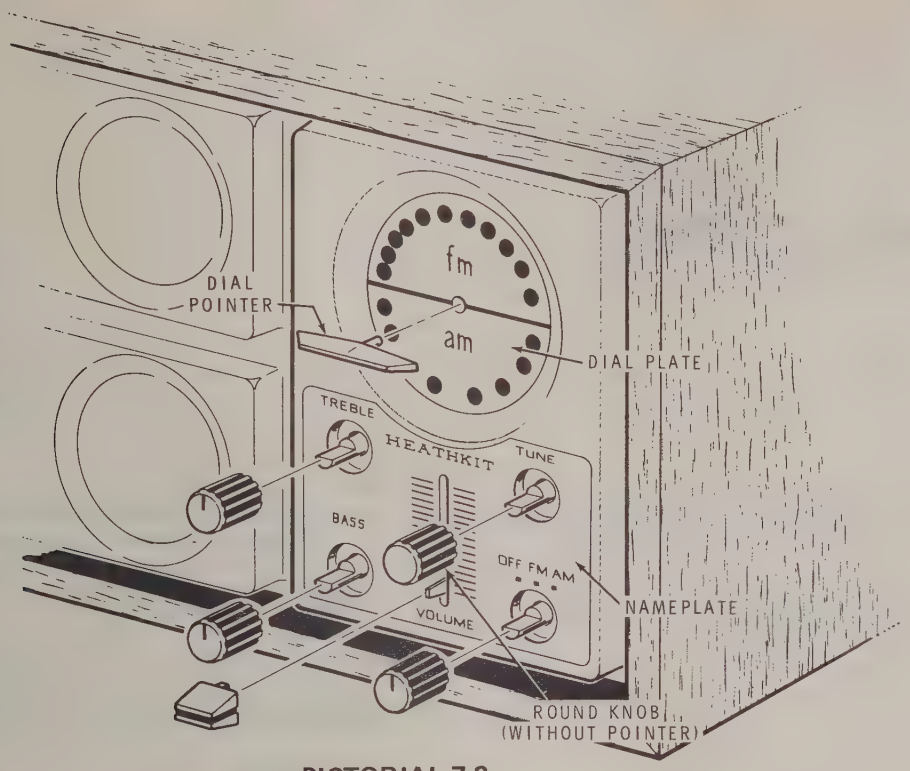
( ) Position the rear panel into the cabinet so the line cord is routed through the cutout in the bottom edge of the panel.

( ) Secure the rear panel to the cabinet with the four phillips-head screws provided with the cabinet. Secure the rear panel to the chassis at CF and CG with two 6-32 x 7/8" screws.

( ) Remove the paper backing from the rear panel instruction label and press the label in place on the rear panel, as shown.

( ) Locate the FCC label. Sign your name on the bottom line and write today's date in the designated space.

( ) Remove the paper backing from the FCC label and press the label in place on the rear panel as shown in the Pictorial.




**PICTORIAL 7-2**

Refer to Pictorial 7-2 for the following steps.

NOTE: Use only moderate pressure when you mount the nameplate in the next step. It is made of soft aluminum and can be misshapen if you use too much force.

( ) Remove the paper backing from the embossed nameplate and press the nameplate in place, squarely over each of the control shafts on the front panel as shown.

( ) Without removing the paper backing, hold the dial plate in place, as it is shown above, and select the most ideal mounting position. This will be a compromise between:

A. Having the center hole squarely over the opening in the center of the recess.

B. Having the dial plate centered in the mounting recess.

( ) Remove the paper backing from the dial plate. Press this plate in place in the recess above the controls as shown. Be sure to position the center line as horizontal or level as possible.

( ) Push the center pin on the back of the dial pointer into the center of the dial recess and on into the center of the pulley shaft adapter.

( ) Push the rectangular slide control knob onto the flat center slide shaft.

( ) Push the round knob without a pointer onto the end of the tuning shaft. Be sure you do not push the knob in too far so it rubs against the nameplate.

( ) Push the remaining three round knobs (with pointers) onto the other three control shafts.

( ) Turn the tuning shaft fully counterclockwise until the dial pointer stops rotating. Grasp the dial pointer and turn it in either direction until the pointer and the horizontal dial line are parallel.

This completes the assembly of your AM-FM Table Radio.

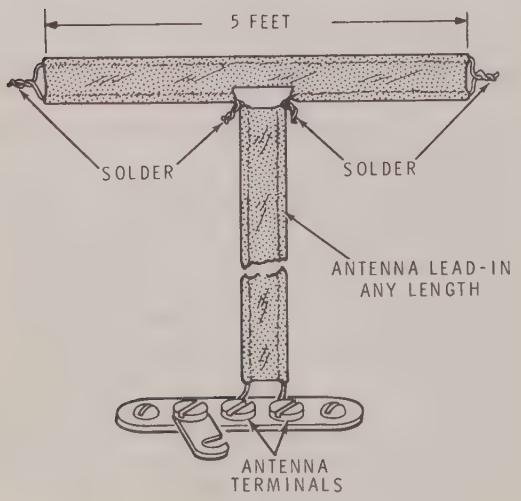
NOTE: If your Radio was wired for 120 VAC operation, you will have a wire nut remaining; you will not need this wire nut.

# OPERATION

Refer to Figure 5-1 (in the "Illustration Booklet") for a description of each of the control functions.

To operate your Radio, plug the line cord into an AC outlet. Turn the OFF-FM-AM switch to the desired mode of operation and the dial to the station of your choice. Adjust the VOLUME slide control, the BASS, and the TREBLE controls to provide the most pleasant sound from the speaker.

## ANTENNAS




FOLDED DIPOLE ANTENNA MADE FROM 300 OHM TWIN LEAD TRANSMISSION LINE

**Figure 6-1**

### AM ANTENNA

You will receive AM broadcasts best when the built-in rod antenna is perpendicular or at right angles to the line toward the broadcast station. The signal will not be as well received when the rod antenna is in line with the direction of the broadcast signal. Therefore, you will often hear a better AM signal if you rotate the Radio cabinet slightly.

### INDOOR FM ANTENNAS

Several types of indoor TV and FM antennas are available that will provide satisfactory reception in strong signal areas, or from strong local stations.

To receive local stations using the built-in FM antenna, connect the jumper lug on the terminal strip to the middle terminal screw.

Figure 6-1 shows how you can make a simple folded-dipole antenna from 300-ohm twin lead. To reinforce this antenna, you can nail or staple it to a narrow strip of wood. You will have the best reception from the broadcast station when the antenna is placed broadside to the signal, and the weakest when the signal comes from the direction of the end of the antenna.

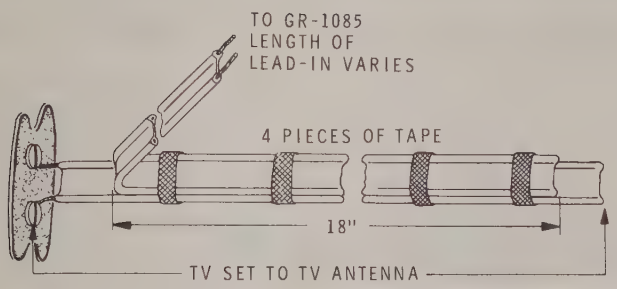



**Figure 6-2**

You may use a standard TV antenna as your FM antenna in the following manner. Refer to Figure 6-2 and cut a length of 300-ohm twin lead. Tape 18" of this twin lead onto the television twin lead as shown. Then connect the other end of the twin lead to the terminals on the back of your AM-FM Table Radio. Be sure to disconnect the jumper lug from the center antenna terminal screw.

## OUTDOOR FM ANTENNAS

You will need an outdoor antenna to receive weak stations in weak signal areas. You can purchase a commercial outdoor FM antenna that will give you the best possible reception. You may also use a VHF television antenna because FM broadcast frequencies fall between those of TV channels 6 and 7.

Do not directly-connect a TV antenna to both the television set and to the Radio at the same time, unless you use a special antenna coupler-splitter that is designed for this purpose, or distortion of the signals may occur at both sets. Pad-type couplers are recommended in strong signal areas. However, if you use a pad-type coupler in a weak-signal area, you may also wish to add a preamplifier to your antenna line.

# IN CASE OF DIFFICULTY

## GENERAL

### VISUAL CHECKS

1. About 90% of the kits that are returned for repair, do not function properly due to poor connections and soldering. Therefore, many troubles can be eliminated by a careful inspection of connections to make sure they are soldered as described in the Soldering section of the "Kit Builders Guide." Reheat any doubtful connections and make sure all the wires are soldered at places where several wires are connected.

2. Make sure that all transistors are in their proper locations, and are installed correctly.

3. Check the value of each part. Make sure that the proper part has been installed into the circuit, as shown in the Pictorial diagrams and as called out in the assembly instructions. It would be easy, for example, to install a 2200 Ω (red-red-red) resistor in a step that calls for a 220 Ω (red-red-brown) resistor.

4. Recheck the wiring. Trace each lead in colored pencil on the Pictorial as it is checked. It is frequently helpful to have a friend check your work. Someone who is not familiar with the unit may notice something you have consistently overlooked.

5. Check all component leads connected to the circuit boards. Make sure the leads are cut off close to the foil and do not make contact with other connections or parts, such as coil shields or the chassis. NOTE: You will find this operation easier if you partially disassemble the chassis halves.

6. If you still cannot find the difficulty, read the "Precautions for Bench Testing" section, and the section titled "How to Troubleshoot Your Radio."

NOTE: In an extreme case where you are unable to resolve a difficulty, refer to the "Customer Service" information inside the rear cover of this Manual. Your Warranty is located inside the front cover.

### PRECAUTIONS FOR BENCH TESTING

1. Be careful when you test transistor circuits. Although transistors have almost unlimited life when used properly, they are much more vulnerable to damage from excessive voltage or current that other circuit components.

2. Make sure you do not short any terminals to ground when making voltage measurements. If the probe should slip, for example, and short out a bias or voltage supply point, it is almost certain to cause damage to one or more transistors or diodes.

CAUTION: The full AC line voltage is present at the rear of the OFF-FM-AM switch and at fuse F1 in the power supply circuit. Be careful to avoid electrical shock when you perform the checks described. Areas where high voltages are present are shown by the boxed-in area in Figure 7-1 (in the "Illustration Booklet").

## HOW TO TROUBLESHOOT YOUR RADIO

If you know in which area the trouble is, apply the "Visual Checks" to that area. Use the "Hum Tests" to locate the area of trouble if you do not know where your difficulty is at.

You may also go directly to the "Troubleshooting Charts" to see if the difficulty is described in one of the "Condition" columns. If your difficulty is listed there, check the "Possible Causes" for that item and apply the "Visual Checks" to the area of difficulty.

## REPAIRING THE RADIO

If you make repairs to your Radio, make sure you eliminate the cause as well as the effect of the trouble. For example, if you should find a damaged resistor, make sure you find out what caused the resistor to become damaged (wiring error, etc.). If the cause is not eliminated, the replacement resistor will also become damaged when you put the Radio back into operation.

# TROUBLESHOOTING CHART

This chart lists the "Condition" and "Possible Cause" of several malfunctions. If a particular part or parts are mentioned (Q107 for example) as a possible cause, check that part to see that it was installed and /or wired correctly. It is also possible for a part to be faulty and require replacement.

| CONDITION | POSSIBLE CAUSE |
|---|---|
| Fuse F1 blows. | 1. Capacitors C508 or C601.<br>2. Diodes D501, or D601 through D604.<br>3. Transistors Q501 through Q507. |
| Audio distortion in both AM and FM. | 1. Capacitor C502 leaky or incorrectly installed. |
| Hum in AM or FM. Hum loudness varies with Volume control. | 1. Shield wire on shielded cable broken or not soldered.<br>2. Wiring on OFF-FM-AM switch.<br>3. Defective OFF-FM-AM switch. |
| Hum in both modes of operation; Volume control has no effect. | 1. Diodes D601 through D604, or zener diode ZD601.<br>2. Capacitors C502, or C601 through C607.<br>3. Transistors Q601 or Q602.<br>4. OFF-FM-AM switch. |
| Control R326 will not calibrate dial scale. | 1. Interchange IC301 and IC302. Then refer to the "Test and Adjustments" on Page 59 and readjust control R326.<br>2. Coil L302 misadjusted.<br>3. Transistors Q305 and Q306, and associated circuitry.<br>4. Tuner assembly. |

# HUM TESTS

NOTE: Use a small screwdriver to perform the hum tests for the "Amplifier" section and the "AM Tuner" sections. Hold the screwdriver by the blade and touch the blade to the indicated test points. Make sure you touch only the points indicated in the tests.

## AUDIO AMPLIFIER SECTION

Refer to Figure 7-2 (in the "Illustration Booklet") to locate test points.

Set the OFF-FM-AM switch to AM and set the Volume control fully downward.

Touch the blade of a small screwdriver with your finger, and then touch the blade to the base (B) of transistor Q501. (This point is shown on the foil side of the audio amplifier circuit board.) You should hear a distinct hum from the speaker. If you do not, a problem exists within the audio amplifier or in the power supply circuit. Carefully check both circuits as outlined in the "General" portion of this section of the Manual.

## TONE CONTROL CIRCUIT

Refer to Figure 7-3 (in the "Illustration Booklet") to locate the test points called out in the Chart. Test points are shown from the foil side of the circuit board.

NOTE: Perform the following steps only after you are sure the audio amplifier circuit is operating properly.

| Test Point | Proper Sound | Possible Cause of Trouble if Proper Sound is Not Heard |
|---|---|---|
| Collector (C) of transistor Q401. | Very faint hum. | 1. Capacitor C406.<br>2. Wiring to audio circuit board. |
| Base (B) of transistor Q401. | Loud hum. | 1. Transistor Q401.<br>2. Resistors R407 or R408.<br>3. 12-volt supply. |

## AM TUNER

Refer to Figure 7-4 (in the "Illustration Booklet") to locate the Test Points called out in the following chart.

Perform these tests if neither the AM or FM sections operate, and if the previous "Audio Amplifier" and "Tone Control Circuit" tests have shown these circuits to be operating properly.

NOTE: Use a small screwdriver to perform the hum tests for the AM tuner circuit. Hold the screwdriver by the blade and touch the blade to the indicated test points. Be sure you touch only the points called out in the tests.

Set the OFF-FM-AM switch to AM.

Position the Volume slide control to its midposition.

| Test Point | Proper Sound | Possible Cause of Trouble if Proper Sound is Not Heard |
|---|---|---|
| Point F on tuner circuit board. | Faint click, faint hum. Varies with Volume control. | 1. OFF-FM-AM switch wiring.<br>2. Volume control (R1) wiring. |
| Base (B) of Q303. | Same as above. You may also hear a local radio station and hum. | 1. Diode D302 or D303.<br>2. Transistor Q302 or Q303. |
| Base (B) of Q302. | Click; then hum and static. You may also hear a local radio station. | 1. Transistor Q302 or Q303. |
| Either lead of R307 (470 Ω resistor). | Faint click. | 1. FL301 or FL302. |
| Collector (C) of Q301. | Click; then static or buzz. | 1. Transformer T302.<br>2. Tuner assembly. |
| Base (B) of Q301. | Click; then loud static or buzz. | 1. Transistor Q301.<br>2. Capacitor C301 or C302.<br>3. Diode D301. |
| Lug 9 of tuner. | Click; then static or buzz. | 1. Rod antenna.<br>2. Diode D301<br>3. Tuner assembly. |

# FM SIGNAL INJECTION TEST

Refer to Figure 7-4 (in the "Illustration Booklet") for the location of the Test Points called out in the following chart.

(Perform these tests if only the FM section does not operate.)

1. Turn the Radio off and unplug the line cord.
2. Remove IC301 from its socket with the IC puller. Remove the IC carefully to avoid bending the leads.
3. Connect an external 300 ohm FM antenna to the FM antenna terminals on the rear of the Radio. NOTE: Most TV antenna systems are 300 ohm.
4. Plug in the line cord and set the OFF-FM-AM switch to FM.
5. Set the Volume control (R1) 1/4" up from the bottom.
6. Prepare a 5" length of white wire. Remove 1/2" of insulation from both ends of the wire.

| Test Point | Proper Sound | Possible Cause of Trouble if Proper Sound is Not Heard |
|---|---|---|
| Note that lug 1 is called out for each IC socket. The Numbers to be located in the chart can be found from this position.<br><br>FM Test #1<br><br>Hold the 5" wire by the bare end and touch the other end to pin 4 of IC302. | Strong local AM radio station heard from speaker. Sound may be distorted. | IC302 or its associated circuitry. NOTE: IC301 and IC302 are identical. If one appears bad, place the other IC in the socket at IC302. Then perform this test again to see if you hear the proper sound. Always make sure the radio is turned off before you remove any IC's. |
| FM Test #2<br><br>Touch one end of the wire to pin 4 of IC302. Push the other end of the wire into pin 4 of the socket at IC301. | Tune the Radio across the entire band. You should hear local FM stations. You may hear local AM stations and hum also. | 1. Tuner assembly.<br>2. Diode D304 or D305. |

NOTE: If you obtained the proper results in all the previous FM tests but still have FM problems with the circuitry restored to normal, the problem area is probably IC301 and FL304.

If you received local AM stations during FM Test #1, this indicates that IC302 is working properly.

If you received local FM stations during FM Test #2, this indicates that the tuner assembly, coil L302, and FL303 are working properly.

# SPECIFICATIONS

## TUNER

### FM SECTION

| | |
|---|---|
| Tuning Range | 87.5 to 108.5 MHz. |
| Intermediate Frequency (IF) | 10.7 MHz. |
| Sensitivity | 5 μV.* |
| Selectivity | 60 dB.* |
| Harmonic Distortion | 1%.* |
| Hum and Noise | −55 dB.* |

### AM SECTION

| | |
|---|---|
| Tuning Range | 535 to 1620 kHz. |
| Intermediate Frequency | 455 kHz. |
| Sensitivity | 300 μV per meter. |
| Selectivity | 40 dB. |
| Hum and Noise | −35 dB.* |

*Rated IHF (Institute of High Fidelity) Standards.

## AMPLIFIER

| | |
|---|---|
| POWER OUTPUT . . . . . | 5 WATTS MINIMUM RMS INTO 8 OHMS AT LESS THAN 1% TOTAL HARMONIC DISTORTION FROM 60 TO 15,000 Hz. |

## GENERAL

| | |
|---|---|
| Power Requirements . . . . . | 120 or 240 VAC ±15%, 50/60 Hz, 25 watts at rated output. |
| Dimensions . . . . . | 13" wide x 7-1/4" deep x 7" high (33 cm x 18.4 cm x 17.8 cm). |
| Net Weight . . . . . | 10 lbs (3.73 kg). |

The Heath Company reserves the right to discontinue products and to change specifications at any time without incurring any obligation to incorporate new features in products previously sold.

# CIRCUIT DESCRIPTION

Refer to the Schematic Diagram and to the Block Diagram (in the "Illustration Booklet") while you read this "Circuit Description."

To help you locate specific parts, the circuit part numbers (R1, C101, L301, etc.) are in the following groups:

| | |
|---|---|
| 0-100 | Parts on the chassis. |
| 201-299 | Parts on the tuner assembly. |
| 301-399 | Parts on the AM/FM circuit board. |
| 401-499 | Parts on the tone circuit board. |
| 501-599 | Parts on the audio amplifier circuit board. |
| 601-699 | Parts on the power supply circuit board. |

## FM TUNER

When OFF-FM-AM switch SW1 is in the FM position, DC power is applied to the FM circuits. As the FM signals are received, they are amplified and then mixed to produce an FM IF signal. This IF signal is then amplified, detected, and the resulting audio is applied to the audio amplifier through contacts on switch SW1. A portion of the IF signal is also amplified and filtered to produce an AGC voltage to help keep the IF level constant. The DC component of the detected signal is also amplified and used for AFC (Automatic Frequency Control) to keep the FM tuner on station.

FM broadcast signals (88 to 108 MHz) are received by the antenna and delivered through the primary of transformer T202 to its secondary. The secondary of T202 connects to the common base FM RF amplifier transistor, Q202, which amplifies the FM RF signals. These amplified signals pass from the collector of Q202 to the tuned circuit formed by L201, C216, C217, and C218, which selects the signals of the desired frequency. The selected signals then pass to the emitter of FM oscillator/mixer transistor Q203.

The tuned circuit formed by L203, C225, C226, and C227 causes Q203 to oscillate at a frequency that is always 10.7 MHz above the selected RF signal frequency. Then, as this signal and the incoming FM RF signal are mixed in Q203, a new signal is produced that is always 10.7 MHz. This 10.7 MHz IF (Intermediate Frequency) signal is routed to transformer T203.

IF transformer T203 is tuned to 10.7 MHz by capacitors C321 and C322. A portion of this signal is taken from between the two capacitors and passed through the 10.7 MHz IF filter, FL303, to IF amplifier IC301.

IF amplifier IC301 has two outputs, one at pin 10 and the other at pin 14. The signal at pin 10 is coupled through C333 to the base of Q304 where it is amplified. Then the signal is coupled through C332 to AGC detector diodes D304 and D305. The detected signal is filtered by resistor R324 and capacitors C326 and C327 to produce a DC voltage that is proportional to the amplitude of the input RF signal. This DC AGC voltage is applied to RF amplifier Q202 and controls the gain of the stage to maintain constant signal levels in spite of varying incoming RF signal levels.

The other output of IC301 (at pin 14) passes through filter FL304 to pin 4 of IF amplifier and quadrature detector IC302. The integrated quadrature detector circuit demodulates the IF signal when an external phase delay of exactly 90 degrees (at 10.7 MHz) is connected between pins 10 and 12 of IC302. This precise delay is produced by capacitor C337, quadrature detector coil L302, and resistor R338. The audio output of the integrated quadrature detector circuit is direct-coupled to IC302 pin 1.

Two signal paths are taken from the output of IC302 (at pin 1). One path is a DC path directly to the AFC differential amplifier, Q306 and Q305. AFC adjust control R326 provides a fixed DC voltage at the base of Q305. The collector voltage of Q305 is proportional to the difference in base voltage of the two transistors. The audio component of the amplified difference voltage is removed by C328 and the resulting DC voltage controls the tuner. The AFC voltage makes accurate tuning easier and compensates for any small drift of the FM oscillator circuit. Control R326 adjusts to correct for any difference between the frequency of the received RF signal and the dial calibration.

The other signal path for the audio output of IC302 is through a de-emphasis network (resistor R341 and capacitor C343), through capacitor C344 to audio preamplifier Q307. The amplified audio signal is routed from the collector of Q307 to OFF-FM-AM switch SW1 through capacitor C346.

## AM TUNER

The AM tuner section consists of an untuned RF amplifier, an autodyne converter, an IF amplifier, and a diode detector. The AM tuner section allows you to receive AM standard broadcast stations from 535 to 1620 kHz.

Broadcast signals are picked up by antenna T301. The desired signal is selected by a tuned circuit that consists of one winding of T301 and tuning capacitor C202, its trimmer capacitor, C203; and a fixed trimmer capacitor, C204. The tuned signal is coupled from the secondary winding of T301 to the base of the untuned RF amplifier, Q301. Base bias for Q301 is adjusted according to the received signal level by an AGC (automatic gain control) circuit which will be discussed later. Diode D301 is an overload diode and presents a very large shunt impedance to the secondary of T301 under all conditions except when very large signals forward bias D301. This creates a low shunt impedance to the secondary of T301.

The received AM signal is amplified by Q301, appears at the collector of Q301, and is coupled through C201 to the base of the autodyne converter in the tuner assembly. Oscillator transformer T201 is tuned by tuning capacitor C208, trimmer capacitor C209, and fixed trimmer capacitor C211 to resonate at 455 kHz above the selected RF signal frequency. The positive feedback necessary for Q201 to oscillate at this frequency is supplied through capacitor C207 to the emitter of Q201. Mixing of the RF signal and oscillator signal takes place in Q201 to produce a third signal which is always a 455 kHz difference signal. This 455 kHz difference signal is the IF signal which appears at tuner assembly pin 12.

The primary of IF transformer T302 is tuned to 455 kHz and passes the IF signal from the tuner assembly to the two ceramic IF filters, FL301 and FL302. These two filters pass only the 455 kHz IF signal on to the base of IF amplifier transistor Q302. Transistor Q302 amplifies the IF signal and passes it on to the base of IF amplifier transistor Q303.

The further-amplified IF signal is passed from the collector of IF amplifier transistor Q303, through capacitor C307, to detector circuit diodes D302 and D303, resistor R315, and capacitors C308 and C311.

Resistors R301, R316, and R317, and capacitor C303 form the AGC circuit, which adjusts the bias on RF amplifier transistor Q301. This controls the stage gain and maintains a nearly constant signal level over extremely wide variations in received RF signal levels.

## FUNCTION SWITCH

OFF-FM-AM selector switch SW1 is rotated to select the desired mode of operation, FM or AM. Power is routed through this switch to the appropriate circuit, depending on the setting of the switch. The amplified audio signals are routed through another portion of SW1 to Volume control R1, and from there to the tone control circuits.

## TONE CIRCUITS

From Volume control R1, the signal is coupled to lug 1 of Treble control R405 and through resistor R401 to lug 1 of Bass control R402. The bass circuit consists of resistors R401, R403, R406, and control R402, and capacitors C401, C402, and C403. The treble circuit consists of resistor R404, control R405, and capacitor C404. The output from the two circuits is routed to the base of transistor Q401.

The signal, amplified by transistor Q401 is fed back through capacitor C405 to lugs 3 of both the Bass and Treble controls. Since there is an input signal at lug 1 of both controls, and an out-of-phase signal at lug 3 of the controls, there is a point on the controls, near the center of each, where the signal is essentially balanced. As the arm of either control is moved counterclockwise, more out-of-phase signal will be applied to the base of transistor Q401. When the control is turned clockwise, more of the input signal is applied to the base of Q401 and a boost in signal results.

Both the bass and treble circuits use the same principle of operation. However, capacitors C401 and C402 in the bass circuit bypass higher frequencies and prevent the control from affecting them. Capacitor C404 in the treble circuit has a low value of capacitance to block low frequencies while it passes the higher ones. Resistor R409 and capacitor C406 attenuate frequencies above 15 kHz.

## AUDIO AMPLIFIER

The signal from the tone circuits is coupled through capacitor C501 and resistor R501 to the base of transistor Q501. Transistors Q501 and Q502 form a differential amplifier circuit. Negative feedback from the output of the amplifier circuit is coupled through R508, R507, and capacitor C507. A differential circuit is so constructed that, at all times, the amplified output signal will be an exact duplicate of the signal appearing at the input of the circuit. Because of inherent circuit characteristics, errors can appear on the signal. When these errors appear at the circuit output, a small error-correcting voltage of the opposite polarity is fed back to the input, thus correcting the error as it appears within the circuit.

The audio signal is routed from the collector of Q501 through Q503 to the base of transistor Q504. The signal also passes through diode D501 to the base of Q505. Diode D501 provides a controlled forward bias on transistors Q504 and Q505. This, in turn, provides bias for output transistors Q506 and Q507. The output of the circuit is routed through capacitor C508 to the connections of the eight-ohm speaker.

Resistor R502 and capacitor C502 keep any power supply hum from the input bias of the amplifier circuit.

# POWER SUPPLY

The power supply circuit consists of a filtered 30-volt DC source for the audio amplifier circuit, and a 12-volt regulator which provides a source of 12-volt DC for the tone and tuner circuits.

The line voltage passes through fuse F1 to contacts on the OFF-FM-AM switch, and then on to the primary windings of power transformer T1. At T1, the primary winding may be connected in parallel for 120-VAC applications or in series for 240-VAC operation.

A secondary winding on the power transformer is connected to a full-wave bridge rectifier circuit that consists of diodes D601 through D604. This rectifier, and capacitor C601, provide the 30-volt source to the audio amplifier. This supply is connected to the regulator circuit through resistor R601. Capacitor C603 provides additional filtering for the regulator circuit.

Resistor R603 and capacitor C604 provide further filtering within the regulator circuit. Resistor R604 provides a collector load for transistor Q602 and is the source of base current for regulator transistor Q601.

When power is first turned on, transistor Q602 has no bias and will not immediately conduct. However, transistor Q601 will be forward-biased by resistor R604. As transistor Q601 charges capacitor C607 to a voltage which is greater than the breakdown voltage of zener diode ZD601, an emitter voltage for transistor Q602 becomes established by the action of resistor R605 and zener diode ZD601. As capacitor C607 changes further, it will begin to forward-bias amplifier Q602 through the resistor divider consisting of resistors R606 and R607.

When amplifier transistor Q602 begins to conduct, it will, in turn, begin to reduce the base bias for regulator transistor Q601. The process is very rapid. Amplifier transistor Q602 continuously adjusts the bias of regulator transistor Q601 to maintain a constant voltage. Capacitor C605 reduces any noise that is generated in ZD601. Capacitor C606 insures that the power supply will not oscillate when there are phase shifts within the circuit. Resistors R601, R602, and R604 set the maximum power dissipated by the regulator circuit under adverse conditions.

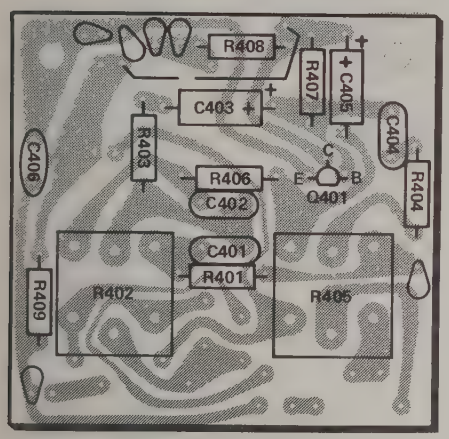
# CIRCUIT BOARD X-RAY VIEWS

Note: To find the part number of a component for the purpose of ordering a replacement part:

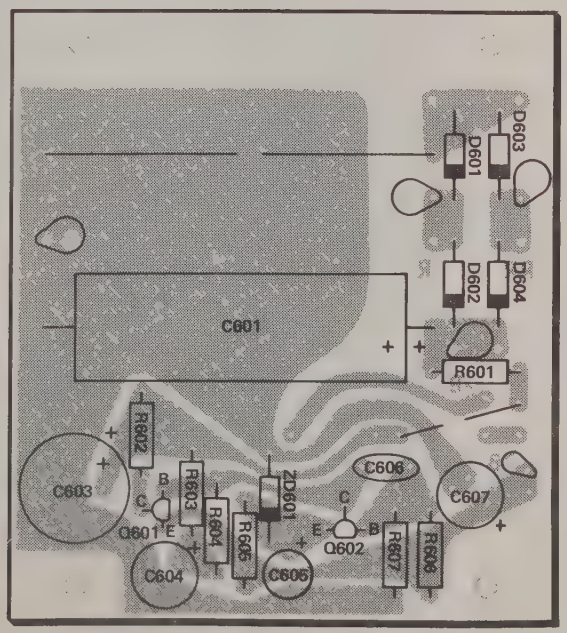
A. Find the circuit component number (R5, C3, etc.) on the "X-Ray View."

B. Locate this same number in the "Circuit Component Number" column of the "Parts Lists."

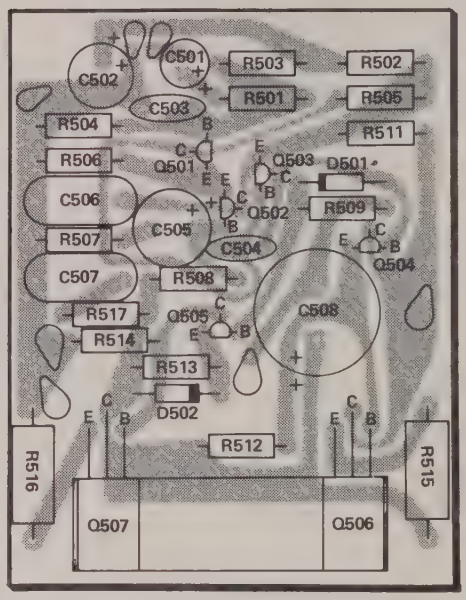
C. Adjacent to the circuit component number, you will find the PART NUMBER and DESCRIPTION which must be supplied when you order a replacement part.



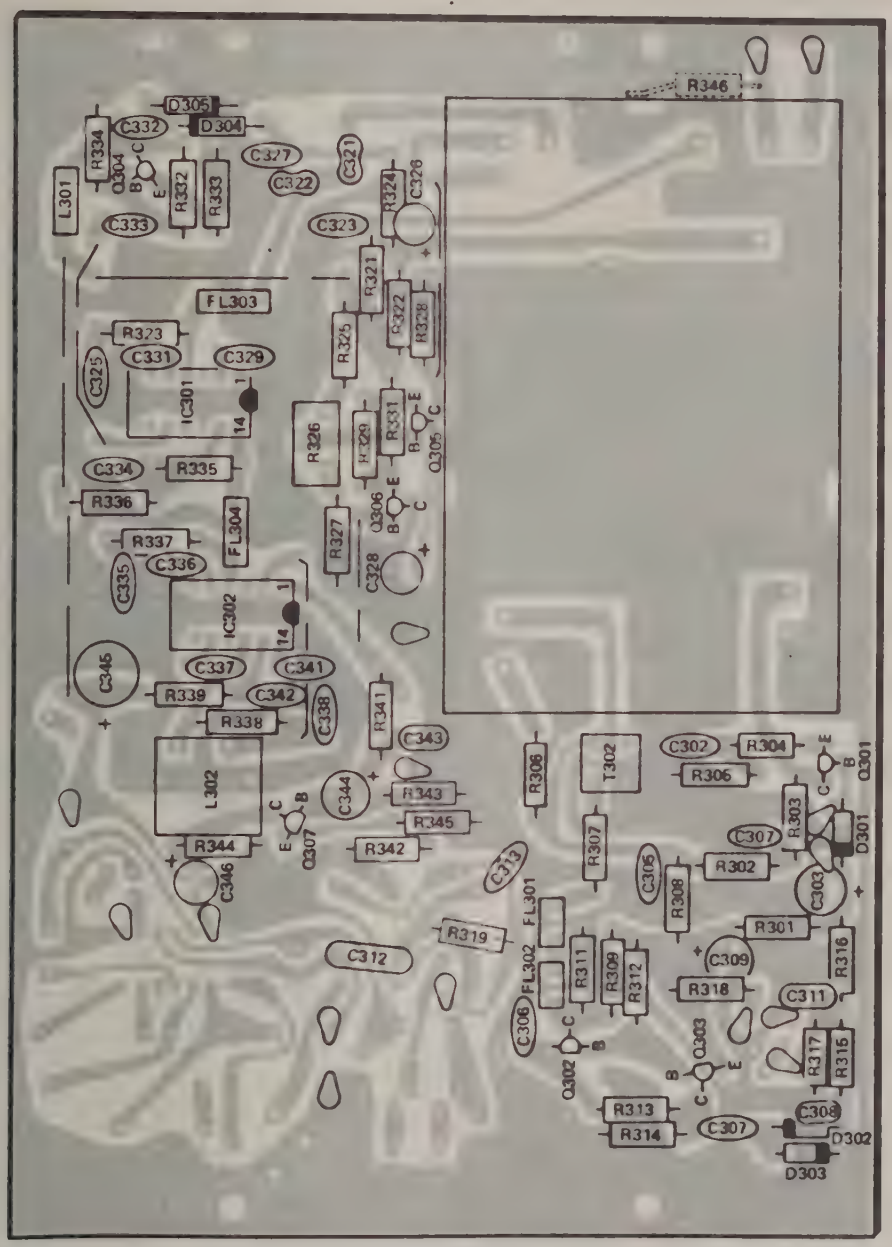

**TONE CIRCUIT BOARD**
**(Shown from component side)**




**POWER SUPPLY CIRCUIT BOARD**
**(Shown from the component side)**




AUDIO AMPLIFIER CIRCUIT BOARD
(Shown from the component side)



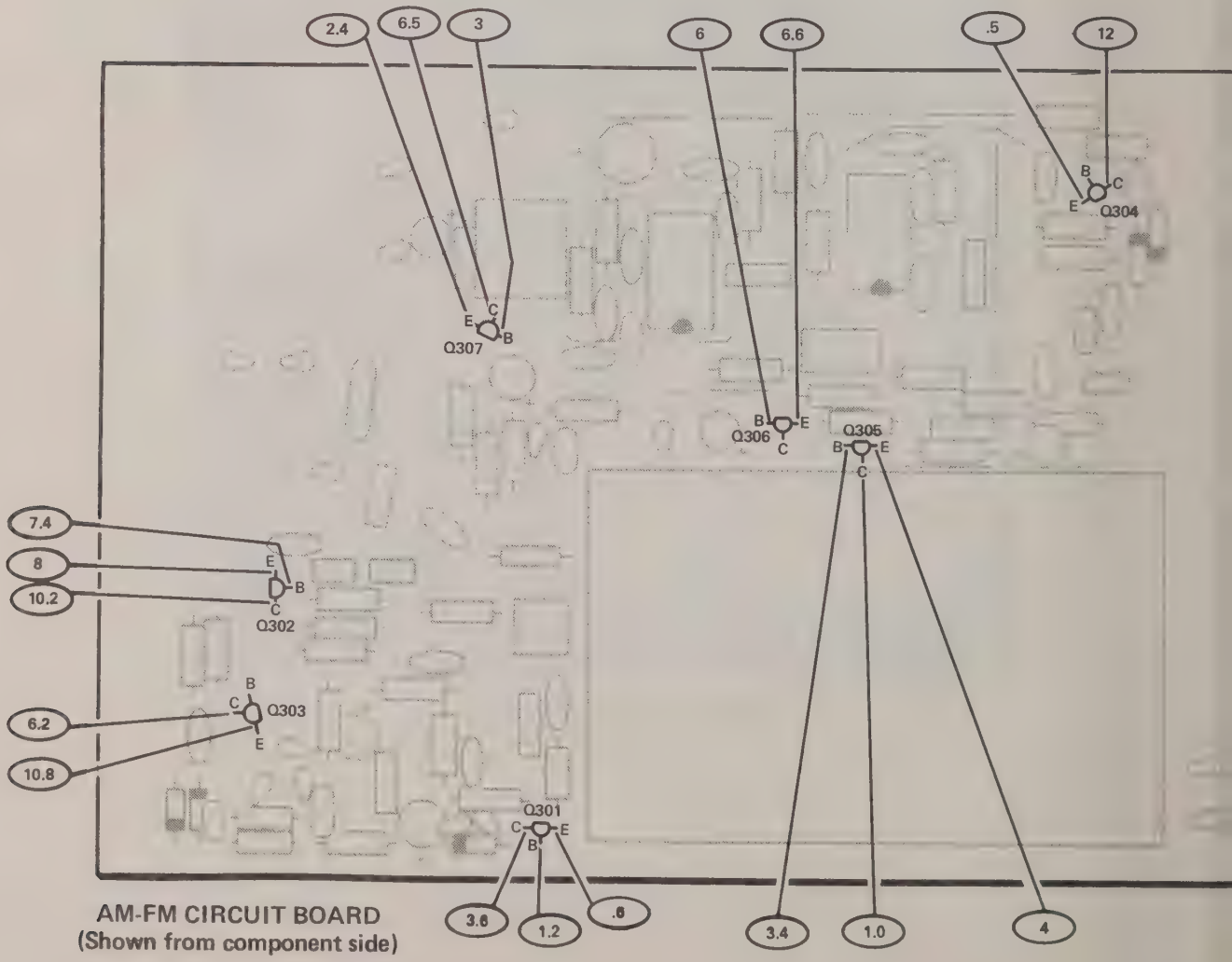

**AM-FM CIRCUIT BOARD**
**(Shown from component side)**

# CIRCUIT BOARD VOLTAGE CHARTS

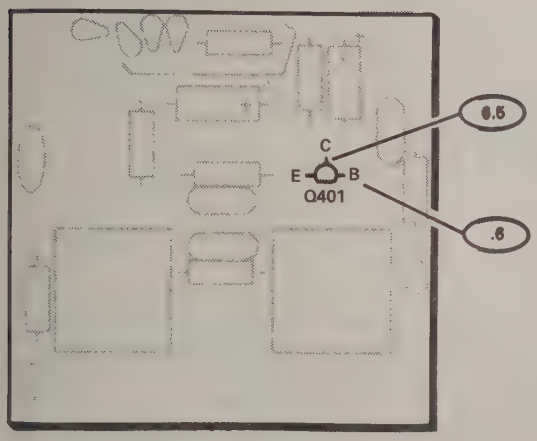
NOTES:

1. Voltages taken from the point indicated to chassis ground with a high impedance input voltmeter.

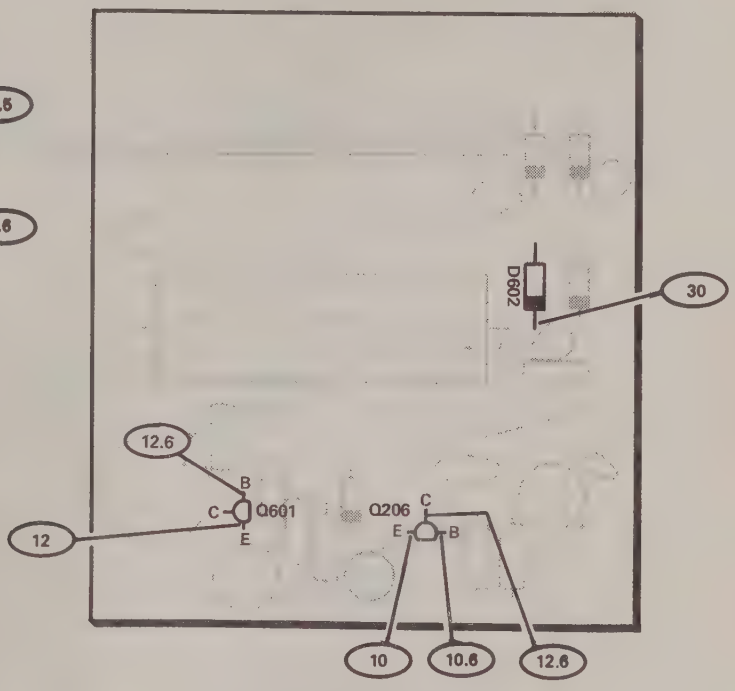
2. Voltage reading may vary ±20%.



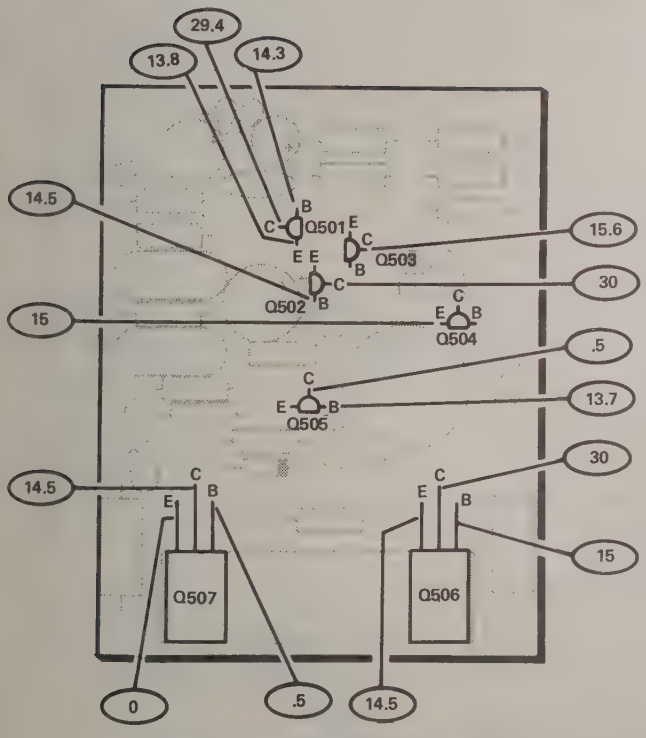

AM-FM CIRCUIT BOARD
(Shown from component side)




Tone Circuit Board
(Shown from the component side)

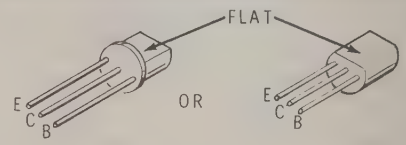
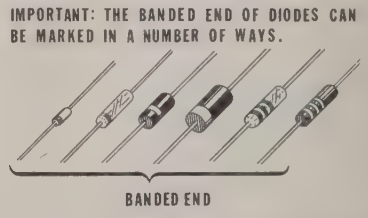
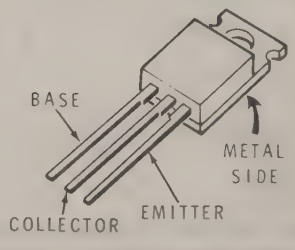


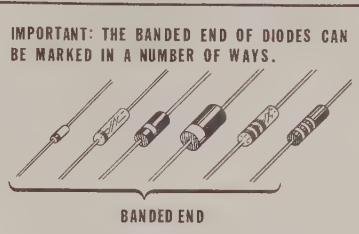
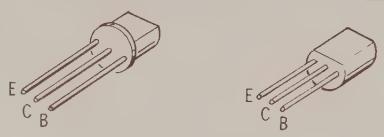
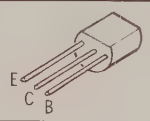
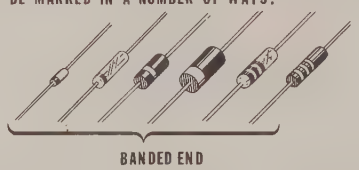
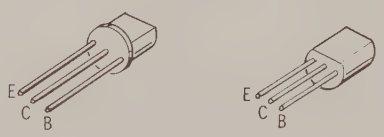
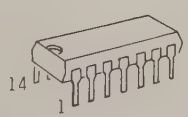

Power Supply Circuit Board
(Shown from the component side)




Audio Amplifier Circuit Board
(Shown from the component side)

# IDENTIFICATION CHARTS

| TONE CIRCUIT BOARD | | | |
|---|---|---|---|
| SCHEMATIC COMPONENT NUMBER | HEATH PART NUMBER | MANUFACTURER'S NUMBER | DIAGRAM |
| Q401 | 417-91 | 2N5232A |   |
| **AUDIO AMPLIFIER CIRCUIT BOARD** | | | |
| D502 | 56-73 | MZ2360 |   |
| D501 | 56-74 | MZ2362 | |
| Q503, Q505 | 417-201 | X29A829 | |
| Q501, Q502 | 417-91 | 2N5232A | |
| Q504 | 417-94 | T.I. ONLY 2N3416 | |
| Q506, Q507 | 417-852 | T.I. P31B |   |

| POWER SUPPLY BOARD | | | |
|---|---|---|---|
| SCHEMATIC COMPONENT NUMBER | HEATH PART NUMBER | MANUFACTURER'S NUMBER | DIAGRAM |
| D601, D602, D603, D604 | 57-65 | 1N4002 |   |
| ZD601 | 56-67 | VR-10A 10V, 12mA ZENER | |
| Q602 | 417-91 | 2N5232A |   |
| Q601 | 417-809 | T.I. 2N3704 |   |
| **AM/FM CIRCUIT BOARD** | | | |
| D301, D302, D303 | 56-26 | 1N191 |   |
| D304, D305 | 56-56 | 1N4149 | |
| Q307 | 417-91 | 2N5232A |   |
| Q303, Q305, Q306 | 417-201 | X29A829 | |
| Q301, Q302, Q304 | 417-801 | MPSA20 | |
| IC301, IC302 | 442-28 | MC1357 |   |

## FOR PARTS REQUESTS ONLY

- Be sure to follow instructions carefully.
- Use a separate letter for all correspondence.
- Please allow 10 - 14 days for mail delivery time.

**DO NOT WRITE IN THIS SPACE**

## INSTRUCTIONS

- Please print all information requested.
- Be sure you list the correct **HEATH** part number exactly as it appears in the parts list.
- If you wish to prepay your order, mail this card and your payment in an envelope. Be sure to include 10% (25¢ minimum, $3.50 maximum) for insurance, shipping and handling. Michigan residents add 4% tax.

  Total enclosed $_____
- If you prefer COD shipment, check the COD box and mail this card. COD ☐

NAME _____

ADDRESS _____

CITY _____

STATE _____ ZIP _____

The information requested in the next two lines is not required when purchasing nonwarranty replacement parts, but it can help us provide you with better products in the future.

Model # _____ Invoice # _____

Date Purchased _____ Location Purchased _____

| LIST **HEATH** PART NUMBER | QTY. | PRICE EACH | TOTAL PRICE |
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| TOTAL FOR PARTS | | | |
| HANDLING AND SHIPPING | | | |
| MICHIGAN RESIDENTS ADD 4% TAX | | | |
| **TOTAL AMOUNT OF ORDER** | | | |

SEND TO: **HEATH COMPANY**
BENTON HARBOR
MICHIGAN 49022
**ATTN: PARTS REPLACEMENT**

Phone (Replacement parts only): 616 982-3571

THIS FORM IS FOR U.S. CUSTOMERS ONLY
OVERSEAS CUSTOMERS SEE YOUR DISTRIBUTOR

CUT ALONG DOTTED LINE


## FOR PARTS REQUESTS ONLY

- Be sure to follow instructions carefully.
- Use a separate letter for all correspondence.
- Please allow 10 - 14 days for mail delivery time.

**DO NOT WRITE IN THIS SPACE**

## INSTRUCTIONS

- Please print all information requested.
- Be sure you list the correct **HEATH** part number exactly as it appears in the parts list.
- If you wish to prepay your order, mail this card and your payment in an envelope. Be sure to include 10% (25¢ minimum, $3.50 maximum) for insurance, shipping and handling. Michigan residents add 4% tax.

  Total enclosed $_____
- If you prefer COD shipment, check the COD box and mail this card. COD ☐

NAME _____

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# CUSTOMER SERVICE

## REPLACEMENT PARTS

Please provide complete information when you request replacements from either the factory or Heath Electronic Centers. Be certain to include the **HEATH** part number exactly as it appears in the parts list.

### ORDERING FROM THE FACTORY

Print all of the information requested on the parts order form furnished with this product and mail it to Heath. For telephone orders (parts only) dial 616 982-3571. If you are unable to locate an order form, write us a letter or card including:

- Heath part number.
- Model number.
- Date of purchase.
- Location purchased or invoice number.
- Nature of the defect.
- Your payment or authorization for COD shipment of parts not covered by warranty.

Mail letters to: Heath Company
Benton Harbor
MI 49022
Attn: Parts Replacement

**Retain original parts until you receive replacements. Parts that should be returned to the factory will be listed on your packing slip.**

### OBTAINING REPLACEMENTS FROM HEATH ELECTRONIC CENTERS

For your convenience, "over the counter" replacement parts are available from the Heath Electronic Centers listed in your catalog. Be sure to bring in the original part and purchase invoice when you request a warranty replacement from a Heath Electronic Center.

## TECHNICAL CONSULTATION

Need help with your kit? — Self-Service? — Construction? — Operation? — Call or write for assistance. you'll find our Technical Consultants eager to help with just about any technical problem except "customizing" for unique applications.

The effectiveness of our consultation service depends on the information you furnish. Be sure to tell us:

- The Model number and Series number from the blue and white label.
- The date of purchase.
- An exact description of the difficulty.
- Everything you have done in attempting to correct the problem.

Also include switch positions, connections to other units, operating procedures, voltage readings, and any other information you think might be helpful.

**Please do not send parts for testing,** unless this is specifically requested by our Consultants.

Hints: Telephone traffic is lightest at midweek — please be sure your Manual and notes are on hand when you call.

Heathkit Electronic Center facilities are also available for telephone or "walk-in" personal assistance.

## REPAIR SERVICE

Service facilities are available, if they are needed, to repair your completed kit. (Kits that have been modified, soldered with paste flux or acid core solder, cannot be accepted for repair.)

**If it is convenient, personally deliver your kit to a Heathkit Electronic Center. For warranty parts replacement, supply a copy of the invoice or sales slip.**

If you prefer to ship your kit to the factory, attach a letter containing the following information directly to the unit:

- Your name and address.
- Date of purchase and invoice number.
- Copies of all correspondence relevant to the service of the kit.
- A brief description of the difficulty.
- Authorization to return your kit COD for the service and shipping charges. (This will reduce the possibility of delay.)

Check the equipment to see that all screws and parts are secured. (Do not include any wooden cabinets or color television picture tubes, as these are easily damaged in shipment. Do not include the kit Manual.) Place the equipment in a strong carton with at least THREE INCHES of *resilient* packing material (shredded paper, excelsior, etc.) on all sides. Use additional packing material where there are protrusions (control sticks, large knobs, etc.). If the unit weighs over 15 lbs., place this carton in another one with 3/4" of packing material between the two.

Seal the carton with reinforced gummed tape, tie it with a strong cord, and mark it "Fragile" on at least two sides. Remember, the carrier will not accept liability for shipping damage if the unit is insufficiently packed. Ship by prepaid express, United Parcel Service, or insured Parcel Post to:

Heath Company
Service Department
Benton Harbor, Michigan 49022

HEATH

Schlumberger

MP MASTER

MA22748

HEATH COMPANY • BENTON HARBOR, MICHIGAN

*THE WORLD'S FINEST ELECTRONIC EQUIPMENT IN KIT FORM*

LITHO IN U.S.A.